

EXHIBIT 5

CONFIDENTIAL - SUBJECT TO PROTECTIVE ORDER

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UNITED STATES DISTRICT COURT
DISTRICT OF MINNESOTA

In Re:

Bair Hugger Forced Air Warming
Products Liability Litigation

This Document Relates To:

All Actions MDL No. 15-2666 (JNE/FLM)

DEPOSITION OF THOMAS H. KUEHN
VOLUME I, PAGES 1 - 351
JULY 10, 2017

(The following is the deposition of THOMAS H. KUEHN, taken pursuant to Notice of Taking Deposition, via videotape, at the offices of Ciresi Conlin L.L.P., 225 South 6th Street, Suite 4600, Minneapolis, Minnesota, commencing at approximately 9:25 o'clock a.m., July 10, 2017.)

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APPEARANCES:

On Behalf of the Plaintiffs:

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On Behalf of Defendants:

Peter J. Goss and Vinita Banthia

BLACKWELL BURKE P.A.

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ALSO PRESENT:

Ronald M. Huber, Videographer

Kansaa Nadeem, Summer Associate, Blackwell
Burke

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15 Article in Journal of Solar Energy,
Airborne Infection Control in
Health Care Facilities, by
Kuehn 292

WITNESS	EXAMINATION BY	PAGE
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	Mr. Goss	328
	Mr. Assaad	339
	Mr. Goss	348

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1 PROCEEDINGS
2 (Witness sworn.)
3 THOMAS H. KUEHN
4 called as a witness, being first duly sworn,
5 was examined and testified as follows:
6 ADVERSE EXAMINATION
7 BY MR. ASSAAD:
8 Q. Good morning. Can you please state your
9 name.
10 A. Yes. My name is Thomas Howard Kuehn.
11 Q. Do you go by Mr. Kuehn or Dr. Kuehn?
12 A. Dr. Kuehn is just -- is fine.
13 Q. Okay. My name's Gabriel Assaad and I'm here
14 with Genevieve Zimmerman, and we represent over 2,000
15 plaintiffs in this multi-district litigation. Now
16 before I begin I just want to go over a few
17 instructions.
18 Have you ever had your deposition taken?
19 A. I have.
20 Q. Approximately how many times?
21 A. Twice.
22 Q. Well I'm going to go through a couple of the
23 ground rules. I'm going to ask you numerous
24 questions. If you don't understand my question,
25 please let me know. Fair?

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1 A. Yes.
2 Q. If you answer the question, I'll assume --
3 I'll assume that understood the question. Fair?
4 A. Yes.
5 Q. Any time you want to take a break, please
6 let me know. I just ask that if you request a break,
7 let it be after you answer a pending question. Fair?
8 A. Okay.
9 Q. Also, with respect to any of your testimony
10 today, I would not like you to guess. If you don't
11 know the answer, just say "I don't know." Fair?
12 A. Yes.
13 Q. I don't think any side here wants any
14 guessing. Fair?
15 A. Yes.
16 Q. Okay. Now the two depositions that you took
17 previously, were they as an expert witness?
18 A. Yes, they were.
19 Q. Okay. Can you please describe the two.
20 A. The first one was a case involving a hotel
21 fire in International Falls, Minnesota. The power
22 company had cut power to the building, this was in
23 winter, so my expertise was requested to determine how
24 fast the building would cool off and how fast the
25 water in the sprinkler-system pipes would freeze such

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1 that the sprinkler system would be inoperable prior to
2 the fire breaking out.
3 Q. And were you an expert for the plaintiff or
4 the defendant?
5 A. That was the plaintiff.
6 Q. Okay. And do you recall the name of the
7 attorney you worked for?
8 A. Yeah. That was about 25, 30 years ago.
9 I -- I do not recall.
10 Q. Okay. Was it here in Minnesota?
11 A. Yes.
12 Q. And do you recall any of the attorneys on
13 the defense side?
14 A. That was so long ago, no, I don't recall.
15 Q. Okay. So 25 years ago, so looking at about
16 early '90s?
17 A. Probably maybe late '80s, early '90s.
18 Q. And you -- you did a deposition; correct?
19 A. Yes.
20 Q. Did you testify at trial?
21 A. Yes.
22 Q. And what was the verdict?
23 A. The plaintiffs did not prevail.
24 Q. Okay. So it was a defense verdict.
25 A. Yes.

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1 Q. Okay. And during that --
2 During your time being an expert for the
3 plaintiff in that case, were any of your opinions
4 limited by the court?
5 A. It was so long ago, I really don't -- don't
6 remember.
7 Q. Okay. Now you said you were an expert -- or
8 you testified in another case.
9 A. Yeah. The second case was with Rochester
10 Meat & Provision Company in Rochester, Minnesota.
11 They -- they are a provider of hamburger patties to
12 restaurant chains. They had recently purchased and
13 installed a large spiral blast freezer to improve
14 their productivity, their output. The blast freezer
15 did not perform according to the specifications
16 supplied by the vendor, so Professor Ramsey and I and
17 a graduate student were initially contacted to just
18 serve as consultants to see if we couldn't resolve the
19 problems. We actually did measurements in their
20 freezer, temperature of patty measurements versus
21 time, freezer temperature, airflow measurements. They
22 adjusted their production to the best they could, they
23 still could not meet production as specified in the
24 requirements, so it went into litigation and I was
25 retained as an expert witness on behalf of Rochester

2 (Pages 5 to 8)

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1 **Meat.**
 2 Q. For the defendant.
 3 **A. For the plaintiff.**
 4 Q. For the plaintiff. Okay. And what was the
 5 outcome of that case?
 6 **A. Outcome of that case was a settlement.**
 7 Q. And did you -- did you --
 8 If it was a settlement, you didn't testify
 9 at trial; correct?
 10 **A. Actually, I was on the stand when there was**
 11 **a recess, and then I was told shortly after that that**
 12 **a settlement had been reached.**
 13 Q. Okay. So you did a deposition and testimony
 14 and --
 15 **A. Yes.**
 16 Q. -- trial testimony.
 17 **A. Yes.**
 18 Q. One more instruction. Wait until I finish
 19 the question before you answer, and I'll try to do
 20 the same, I'll try to wait until you finish your
 21 answer. It's better for the court reporter, it's a
 22 cleaner transcript. Fair?
 23 **A. Yes.**
 24 Q. And I understand many times you will predict
 25 what my question is going to be; just wait just until

Page 11

1 Q. Okay. And that would be the same thing with
 2 the Rochester Meat, it was more of a heat-transfer
 3 problem.
 4 **A. Yes, that's correct.**
 5 Q. And nothing to do with fluid flow or
 6 particle flow; correct?
 7 **A. Nothing to do with particle flow, although**
 8 **there was fluid flow involved in the hamburger-**
 9 **freezing blast freezer.**
 10 Q. Fair enough.
 11 Have you ever consulted for 3M before?
 12 **A. No, I have not.**
 13 Q. What about Arizant?
 14 **A. No, I have not.**
 15 Q. Before this litigation were you aware of a
 16 company called Arizant?
 17 **A. Not that I recall, no.**
 18 Q. What about Augustine Medical, had you ever
 19 heard about Augustine Medical before this litigation?
 20 **A. No.**
 21 Q. Do you know who Scott Augustine is?
 22 **A. I did not before this litigation began.**
 23 Q. Fair enough.
 24 So you've been retained as an expert in this
 25 case; correct?

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1 I finish the question. And I will usually look up at
 2 you and wait for an answer.
 3 **A. Okay.**
 4 Q. Do you have copies of any of the
 5 transcripts, deposition transcripts in your previous
 6 cases where you acted as an expert?
 7 **A. Again, this was also 25, 30 years ago. I --**
 8 **I certainly do not have anything in my possession at**
 9 **present.**
 10 Q. So --
 11 And that would have been in the late '80s
 12 for Rochester Meat?
 13 **A. Again, either late '80s or early '90s.**
 14 Q. Okay. Fair enough.
 15 Besides those two cases in which you
 16 testified either in a deposition or trial, were you
 17 ever retained by a law firm as a consulting expert?
 18 **A. Not that I can recall.**
 19 Q. And so my understanding with respect to the
 20 first case dealing with the pipes freezing, that dealt
 21 with mostly, you know, how fast a building would cool
 22 down and how fast the pipes would get down to below
 23 freezing and freeze.
 24 **A. That's correct. It was really a heat-**
 25 **transfer study.**

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1 **A. That's correct.**
 2 Q. And as an expert you would agree that when
 3 you look at a problem, you should be objective;
 4 correct?
 5 **A. That's correct.**
 6 Q. You're not here to be an advocate for 3M or
 7 the plaintiffs; correct?
 8 **A. I'm just trying to deliver my expertise**
 9 **and -- and be as accurate and honest as possible.**
 10 Q. To be objective and be impartial; correct?
 11 **A. That's correct.**
 12 Q. And you're aware that you're under oath;
 13 correct?
 14 **A. Yes.**
 15 Q. And that means that here today it's like
 16 being in trial; correct?
 17 **A. I -- I assume that's correct.**
 18 Q. Okay. And you understand that your
 19 testimony should be -- should be truthful.
 20 **A. Yes.**
 21 Q. And objective.
 22 **A. Yes.**
 23 Q. And it's under the penalty of perjury if
 24 you're not truthful. Do you understand that?
 25 **A. Yes.**

3 (Pages 9 to 12)

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1 Q. Now what's your current status at the
2 University of Minnesota?
3 **A. I retired approximately one year ago, so I'm**
4 **officially a professor emeritus.**
5 Q. And you understand as a professor in an
6 academic institution, providing false data or false
7 results would be considered fraudulent; correct?
8 MR. GOSS: Object to form.
9 **A. That's certainly not according to the**
10 **ethical standards I was -- I was raised to believe in.**
11 Q. Okay. When you talk about ethical
12 standards, you're talking about engineering ethics?
13 **A. Yes.**
14 Q. And such, you know, providing false data or
15 false results would be considered fraudulent; correct?
16 MR. GOSS: Object to form.
17 **A. I -- I would believe so.**
18 Q. Okay. And sitting here today, you wouldn't
19 put -- you would never commit -- strike that.
20 It's my understanding that you recently went
21 over your report and checked all your calculations;
22 correct?
23 **A. That's correct.**
24 Q. Okay. And you did that on Friday; correct?
25 **A. One of the exhibits, not the entire report.**

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1 Q. Okay. But you have checked your report for
2 accuracy; correct?
3 **A. Yes.**
4 Q. And being a pro -- professor emeritus, you
5 would never -- you would never commit research fraud
6 or put your name on a court document that you do not
7 believe in; correct?
8 **A. I would say that's correct.**
9 Q. And I assume when you checked all your work
10 prior to -- in preparation of this deposition, that
11 all your calculations made engineering sense; correct?
12 **A. They -- they certainly made engineering**
13 **sense when I was developing them initially. Of course**
14 **all engineering calculations are subject to some level**
15 **of uncertainty in some of the values that are -- that**
16 **are put in. But within engineering judgment, I**
17 **believe they to be -- them to be correct.**
18 Q. So are there some --
19 Are you sitting here today to say that some
20 of the numbers that were used in your calculations
21 you're uncertain about?
22 **A. I would say the precision of some of the**
23 **numbers I -- I do not know very precisely.**
24 Q. Can you elaborate on that a little bit?
25 **A. I would say my definition of "precision"**

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1 **would be, for example, how many significant figures of**
2 **a number you believe are absolutely correct, and in**
3 **many cases an engineer needs to make a -- a judgment**
4 **call in terms of how many significant digits are --**
5 **are defensible and -- and how many are perhaps digging**
6 **a little bit too keep into the details.**
7 Q. Are any of the numbers that you have
8 measured or used -- strike that.
9 Now we're going to go through your report
10 today. If any time you realize that any of your
11 calculations are wrong or your statements are wrong,
12 can you please let me know?
13 **A. I will let you know, yes.**
14 Q. Because right now this is my only chance to
15 take your deposition in this case, and my goal is to
16 find out what your opinions are. Do you understand
17 that?
18 **A. Yes.**
19 Q. Okay. And if there is a mistake or you
20 realize there needs to be another correction, this is
21 the time to do it. You understand that?
22 **A. Yes.**
23 Q. Okay. You were retained back in February of
24 this year by the defense in this case; correct?
25 **A. That's correct.**

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1 Q. Did you obtain any other students or
2 graduate students or anyone else to assist you with
3 your report?
4 **A. No. This is entirely my own work.**
5 Q. Okay. So no one assisted you at all.
6 **A. That's correct.**
7 Q. So when you --
8 Was there a -- a written agreement between
9 you and Blackwell Burke or 3M with respect to the
10 scope of your work?
11 **A. I think it was primarily verbal.**
12 Q. Okay. And do you know how 3M obtained your
13 information to contact you?
14 **A. I do not know that.**
15 Q. Okay. Do you know who contacted you from 3M
16 or Blackwell Burke?
17 **A. Yes. It was a woman lawyer that --**
18 **I can't remember her first name off the top**
19 **of my head.**
20 Q. What was her last name?
21 **A. The name escapes me. I'm sorry, I can't --**
22 **I can't come up with that at the moment.**
23 Q. Was it by e-mail or was it by telephone?
24 **A. By phone contact.**
25 Q. Okay. Are you still teaching classes at the

4 (Pages 13 to 16)

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1 University of Minnesota?

2 **A. Not regular classes. I'm still involved in**

3 **a summer short course.**

4 Q. Is that the one this August?

5 **A. Yes.**

6 Q. Okay. With Professor -- with -- with Jim

7 Ho?

8 **A. Yes.**

9 Q. Okay. I take it you know Jim Ho personally.

10 **A. I do.**

11 Q. Okay. And you've actually written papers

12 with him.

13 **A. One paper.**

14 Q. Okay. When was the last time you talked to

15 Jim Ho?

16 **A. I think that my last correspondence with him**

17 **was e-mail, probably sometime last fall.**

18 Q. So you have not discussed this case with Jim

19 Ho.

20 **A. I have not.**

21 Q. Okay. Have you discussed this case with

22 anyone outside Blackwell Burke or 3M?

23 **A. I have not.**

24 Q. Now prior to conducting your work in this

25 case, did you prepare any protocols or methodologies

Page 19

1 **A. Not --**

2 Q. Not in this case?

3 **A. Not associated with this case.**

4 Q. Okay. Have you ever done that in the past?

5 **A. I have.**

6 Q. And what program do you usually use?

7 **A. I started back in the '80s actually writing**

8 **my own from -- from scratch, and more recently my**

9 **students have used a program called Fluent or --**

10 **trying to think of the more current name -- CFX.**

11 Q. ANSYS?

12 **A. Not --**

13 Q. CFX.

14 **A. CFX, yes.**

15 Q. Okay. And is that the academic version of

16 Fluent and CFX?

17 **A. They're available through our Supercomputer**

18 **Institute on campus, so I -- I -- I'm not sure of the**

19 **actual --**

20 Q. Okay.

21 **A. -- designations.**

22 Q. Are students allowed to use that for

23 commercial activities?

24 **A. Um --**

25 Q. Do you know one way or the other?

Page 18

1 with respect to how you're going to attack the issue?

2 MR. GOSS: Object to form.

3 **A. Your -- your question was prior to my --**

4 Q. Well let's back up. I'll -- that's a good

5 objection. What was your --

6 What was the scope of your work in this

7 case?

8 **A. The scope of my work was to address issues**

9 **involving filtration and particle movement primarily.**

10 Q. Were those the only two issues?

11 **A. Also did some work with temperature**

12 **measurements and velocity measurements.**

13 Q. Anything else?

14 **A. Those were the main -- main topic areas.**

15 Q. And what are the minor topic areas?

16 **A. Well there's -- there's aerosol science**

17 **which -- which underlies -- its principles underlie**

18 **particle motion and particle attachment/detachment,**

19 **aerosol measurement technology instrumentation.**

20 Q. Anything else?

21 **A. Also computational fluid mechanics and --**

22 **and the particle motion predicted by computational**

23 **fluid dynamics.**

24 Q. Did you do any type of computational fluid

25 dynamics?

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1 **A. Yes. The -- the license agreement is**

2 **different, but -- but yes, they are allowed to do**

3 **that.**

4 Q. They're allowed to use its for commercial

5 purposes?

6 **A. Yes.**

7 Q. And for research?

8 **A. Yes.**

9 Q. And that's a license with -- between the

10 University of Minnesota and ANSYS?

11 **A. Or -- or --**

12 **Yes. Or the -- or the parent company of the**

13 **software.**

14 Q. Well you understand that Fluent and CFX is

15 owned by ANSYS. Do you understand that?

16 **A. I -- I --**

17 Q. A-N-S-Y-S.

18 **A. If you say so. I'm not aware of the**

19 **details.**

20 Q. When is the last time you used ANSYS?

21 **A. I have never used ANSYS personally.**

22 Q. When was the last time you performed a

23 computational fluid dynamic using a supercomputer?

24 **A. Personally, it was probably 20 years ago.**

25 Q. Okay. So you agree with me that you're not

5 (Pages 17 to 20)

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<p style="text-align: right;">Page 21</p> <p>1 up to date with respect to the current capabilities 2 with respect to ANSYS, Fluent, or CFX; correct? 3 A. I would not agree with that. I think I am 4 aware of the capabilities, I've just not done that 5 type of simulation work myself. 6 Q. Okay. So you're aware of the -- the code 7 that ANSYS uses with respect to CFX or Fluent? 8 A. I'm aware of the basic fundamental code that 9 began with Professor Patankar that then became Fluent, 10 that then became CFX. 11 Q. I understand that. But there are many 12 versions that have occurred since 20 years ago. You 13 understand that; correct? 14 A. Yes, I understand that. 15 Q. Okay. And you understand that the output is 16 usually only as good as the code; correct? 17 A. Well the -- the code itself and the user 18 inputs, including boundary conditions. 19 Q. But the code is very important. 20 A. The code has been well validated, yes. 21 Q. Okay. So it's the code that's validated; 22 correct? 23 A. Yes. 24 Q. Okay. So when -- when an engineer such as 25 yourself performs a CFD analysis and says it's</p>	<p style="text-align: right;">Page 23</p> <p>1 performed and how that's done. 2 Q. Well what do you mean by that? 3 A. Some type of evaluation are -- is 4 corresponding -- or comparing results for fluid 5 mechanics flow measurements, velocity measurements to 6 experimental data, sometimes it's comparing one set of 7 -- one type of code to another -- another type of 8 code. So there's -- there are numerical comparisons 9 code to code and also comparisons with experiments. 10 Q. For example, if a code has been validated 11 for jet-engine combustion, by comparing the CFD 12 results to experimental data, you would agree that 13 that code now is validated for other types of jet- 14 engine combustion that are less complex than what the 15 validation scenario was provided. 16 A. As long as the same code is used, the same 17 subroutines. There are also issues; for example, 18 turbulent modeling and what parameters to put in 19 there. 20 Q. For turbulence, for flow, for combustion, if 21 it's been validated experimentally, the code is 22 validated for less-complex modeling; correct? 23 A. I would -- 24 MR. GOSS: Object to form. 25 A. I would -- I would think it would be</p>
<p style="text-align: right;">Page 22</p> <p>1 validated, it means that the code is validated; 2 correct? 3 MR. GOSS: Object to form. 4 A. I -- I would think that's what it would 5 represent. 6 Q. As someone in your field, as a doctor in 7 engineering that has done CFD, that is the term of art 8 used. When you say this -- this -- this CFD analysis 9 is validated, you mean the code is validated; correct? 10 MR. GOSS: Same objection. 11 MR. ASSAAD: Basis. 12 MR. GOSS: Vague. 13 Q. Do you understand my question? 14 A. I would -- I would respond and say that 15 the -- the code itself has been validated, but not any 16 particular results derived from that. 17 Q. But to validate a code -- 18 The code is used for very complex questions 19 or analysis; correct? 20 A. It -- it can be. 21 Q. Okay. And if it's -- if it's validated for 22 a very complex model, then it would be validated for 23 less-complex models looking for the same type of 24 results; correct? 25 A. It really depends what type of validation is</p>	<p style="text-align: right;">Page 24</p> <p>1 accurate for less-complex flows. 2 Q. Okay. And so when an engineer such as 3 yourself that has used CFD analysis, when a code is 4 validated for a complex model, that means that less- 5 complex models could be used with the same CFD code 6 and obtain accurate results; correct? 7 A. Again, it depends on the user. If they're 8 using the code accurately and if the boundary 9 conditions are correct. 10 Q. Okay. I understand there's a boundary 11 question and whether or not you've input the 12 information correctly, but for the actual mathematical 13 results depend -- based on correct boundary 14 conditions, the computational analysis performed by 15 the CFD is validated; -- 16 MR. GOSS: Object -- 17 Q. -- correct? 18 MR. GOSS: Object to form. 19 A. I would -- I would not say validated. 20 Q. You would not say validated? 21 A. No. 22 Q. What would you say? 23 A. I would say it's most likely correct, but to 24 me validation means there's some other means of 25 checking the results.</p>

6 (Pages 21 to 24)

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1 Q. Okay. Well that's different. That's
2 verification; correct?
3 **A. I -- I guess if we define that to be**
4 **verification, yes.**
5 Q. Well you're the doctor in engineering. Do
6 you understand the difference between validation with
7 the CFD code and verification?
8 **A. I'm not sure I -- I --**
9 Q. You've never heard --
10 **A. -- know the difference.**
11 Q. You've never heard those terms?
12 **A. I've heard the terms, but I'm not sure I**
13 **ever distinguished between the two.**
14 Q. What do you teach your students with respect
15 to validation?
16 **A. I really don't teach any -- any CFD in my**
17 **course work.**
18 Q. Okay. Are you familiar with any other CFD
19 programs besides ANSYS?
20 **A. I'm familiar with older ones I used to work**
21 **with; for example, Fluent and -- and the Patankar**
22 **original code.**
23 Q. Okay. Are you familiar with STAR-CCM?
24 **A. I am not.**
25 Q. Have you heard of STAR-CCM?

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1 Q. And you -- and also what?
2 **A. Provided by counsel.**
3 Q. So you did a literature review -- review?
4 **A. Yes.**
5 Q. On your own?
6 **A. Yes.**
7 Q. Okay. And where did you do the literature
8 review?
9 **A. On my laptop.**
10 Q. Okay. Did you Google or did you go to some
11 sort of a --
12 **A. I used -- used Google.**
13 Q. Okay. And how long did you spend doing
14 literature review?
15 **A. Probably not very long. Maybe -- maybe an**
16 **hour or so.**
17 Q. One hour.
18 And what were your search terms, do you
19 recall?
20 **A. I'm -- I'm trying to recall what I was**
21 **searching for at that time.**
22 Q. Sitting here today, do you recall what you
23 were searching for at that time?
24 **A. Not off the top of my head.**
25 Q. Okay. Did you print any of the research

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1 **A. I don't think I have.**
2 Q. Okay. Now with respect to the issues that
3 you were asked to address by the defense in this case,
4 which is the filter particle movement with a
5 subcategory of aerosols, temperature increase,
6 velocity, and a little bit of computational fluid
7 analysis --
8 Is that the word you used?
9 **A. I -- I believe that's the word I used.**
10 Q. Okay. Is there anything else that you were
11 asked to do in this case?
12 **A. Not that I can recollect.**
13 Q. Okay. Prior to doing any work, did you
14 prepare any protocols or methodologies with respect to
15 your analysis of these issues?
16 **A. Prior to being retained, is that the**
17 **question?**
18 Q. No. After you had been retained but prior
19 to doing any testing or formulating your opinions.
20 **A. Could you repeat question, please?**
21 Q. Prior to formulating your opinions, did you
22 prepare any type of protocol or analysis on how you
23 would solve these issues?
24 **A. I did some literature review and also**
25 **reviewed some material provided by counsel.**

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1 that you found?
2 **A. I did not, because I don't have a printer at**
3 **home.**
4 Q. Okay. Did you save any of them?
5 **A. Yes, I did.**
6 Q. Okay. And you --
7 And do you recall any of the articles that
8 you saved?
9 **A. One of them was an article by Dr. Tsai and**
10 **Dr. Pui dealing with particle adhesion on surfaces.**
11 **Another one was a study done by some researchers in**
12 **the Netherlands on particle removal from surfaces.**
13 Q. Anything else?
14 **A. Those are the two that come to mind.**
15 Q. All the articles that you saved, are they
16 listed in your report under Exhibit E?
17 **A. They are -- I'm -- I'm --**
18 **They should be listed in the report**
19 **somewhere, whether -- which exhibit I -- I can't say.**
20 Q. Okay.
21 **A. They may be in the main -- main body of the**
22 **report, they may be in one of the exhibits, or maybe**
23 **both.**
24 Q. Did you do any literature search with
25 respect to Bair Hugger?

7 (Pages 25 to 28)

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1 **A. I think I did, just to get a -- a look --**
 2 **look at the -- essentially the user's manual.**
 3 Q. Did you look at anything else?
 4 **A. Regarding Bair Hugger, that -- that's all**
 5 **I -- I was looking at.**
 6 Q. And the -- the three articles listed in
 7 Exhibit E with respect to peer-reviewed literature
 8 regarding the Bair Hugger, that was provided to you by
 9 counsel; correct?
 10 **A. I would have to see what they are to respond**
 11 **to that.**
 12 Q. The two Albrecht articles and the Reed
 13 article.
 14 **A. I believe they were all provided by counsel.**
 15 Q. Okay. Any other documents or literature
 16 provided by counsel?
 17 **A. Yes.**
 18 Q. What?
 19 **A. There was a report by -- filter testing that**
 20 **3M had done.**
 21 Q. I'm talking about peer-reviewed literature
 22 **A. Oh, peer-reviewed literature. Not that I**
 23 **can think of off the top of my head.**
 24 Q. Okay.
 25 **A. Well there -- there was a -- I should --**

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1 **There was a study that attempted to**
 2 **correlate particle concentration versus biological**
 3 **particle correlation.**
 4 Q. Is that the DeRue study?
 5 **A. That's not the first author I'm thinking of.**
 6 Q. Stocks?
 7 **A. Stocks, yes.**
 8 Q. Okay. When was that provided to you?
 9 **A. I think it was on Friday.**
 10 Q. This Friday?
 11 **A. (Nodding.)**
 12 Q. Okay. Have you reviewed any of the expert
 13 reports, defense expert reports?
 14 **A. I have.**
 15 Q. Okay. Which ones?
 16 **A. I'm sorry, you said defense expert reports.**
 17 Q. Yes.
 18 **A. I have reviewed some of the plaintiffs'**
 19 **reports.**
 20 Q. And I have a list in Exhibit E of what you
 21 reviewed.
 22 **A. Yeah.**
 23 Q. I'm talking about defense experts.
 24 **A. Not that I can recall right -- right at the**
 25 **moment.**

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1 Q. Okay. Do you know who --
 2 Do you know Jim Ho is an expert in this
 3 case?
 4 **A. Yes.**
 5 Q. He's a friend of yours; correct?
 6 **A. Yes.**
 7 Q. Did you review his report?
 8 **A. I have not seen his report.**
 9 Q. Do you know who John Abraham is?
 10 **A. Yes.**
 11 Q. Do you know him personally?
 12 **A. Yes.**
 13 Q. He was a student at the University of
 14 Minnesota; correct?
 15 **A. Yes.**
 16 Q. Did you ever teach any of his classes?
 17 **A. I don't believe so.**
 18 Q. Okay. His focus was on heat transfer just
 19 like you; correct?
 20 **A. That's what I've been told by counsel.**
 21 Q. Okay. When was the last time you spoke with
 22 John Abraham?
 23 **A. Probably several years ago.**
 24 Q. Did you teach --
 25 Do you recall teaching any of his classes?

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1 **A. No, I do not.**
 2 Q. Okay. Do you know if he was an A student, B
 3 student, C student?
 4 **A. I -- I cannot recall that.**
 5 Q. Okay. Do you know who Gary Settles is?
 6 **A. I do.**
 7 Q. Personally?
 8 **A. I -- I know of him. I don't think I know**
 9 **him personally.**
 10 Q. Have you read his report?
 11 **A. I have not.**
 12 Q. Okay. Do you know who Michael Keen is?
 13 **A. I do not.**
 14 Q. Okay. Have you read his report?
 15 **A. I have not.**
 16 Q. So do any of these names sound familiar with
 17 respect to reports that you've seen: Abraham, Borak,
 18 Hannenberg, Ho, Hulford, Hughes, Keen, Lampotang,
 19 Mont, Settles, Ulatowski or Wenzel? Have you seen any
 20 of -- any of their reports?
 21 **A. I have not seen any of those reports.**
 22 MR. ASSAAD: Okay. I'd like to mark your
 23 report as --
 24 THE REPORTER: Exhibit 1.
 25 MR. ASSAAD: -- 1.

8 (Pages 29 to 32)

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1 (Kuehn Exhibit 1 was marked for
2 identification.)
3 MR. ASSAAD: And I'd like to mark as Exhibit
4 2 the corrected version of Exhibit C.
5 (Kuehn Exhibit 2 was marked for
6 identification.)
7 BY MR. ASSAAD:
8 Q. Now Dr. Kuehn, I represent to you that this
9 is an exact copy of the report that was provided to us
10 by counsel, as well -- which includes the report
11 Exhibits A, B, C, D and E as Exhibit 1, and Exhibit 2
12 is the corrected Exhibit C. Do you agree with me?
13 **A. Well I'll take your word for it.**
14 Q. Well I don't want you to take your word --
15 my word for it. I want it on the record that you
16 agree with me that Exhibit 1 and 2 is your report,
17 unless your counsel wants to stipulate to that.
18 MR. GOSS: Do you want to just take a minute
19 to flip through it?
20 THE WITNESS: Yeah. I'd ask to take a look
21 to verify that.
22 MR. GOSS: I have no reason to think it's
23 not a bad -- that it's not an accurate copy, but if
24 you want him on the record, he might as well take a
25 look.

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1 **A. Okay. Yes, I agree this is an accurate**
2 **copy.**
3 Q. For the record, Exhibit 1 and Exhibit 2 is
4 an accurate copy of your report, Exhibits A, B, C, D
5 and E of your report; correct? For Exhibit 1;
6 correct?
7 **A. With Exhibit 2 being the corrected Exhibit**
8 **C.**
9 Q. And Exhibit 2 is a corrected version of
10 Exhibit C that was provided to counsel on Friday, July
11 7th, 2017; correct?
12 **A. I believe that's when it was provided.**
13 Q. Okay.
14 **A. I do -- I do not know that.**
15 Q. Well when did you correct your report?
16 **A. Friday.**
17 Q. Okay. So it couldn't have been provided --
18 provided to us earlier than Friday; correct?
19 **A. No. Right.**
20 Q. Okay. And therefore I assume that you
21 recently reviewed your entire report; correct?
22 **A. I -- I did look through it, yes.**
23 Q. Are there any other corrections, sitting
24 here today, that you'd want to inform me before we get
25 into your report?

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1 **A. No.**
2 Q. Okay. So you believe at this point in time
3 that the report reflects all the opinions you intend
4 to offer to the court and to the jury in this matter;
5 correct?
6 MR. GOSS: Object to form.
7 MR. ASSAAD: Basis.
8 MR. GOSS: Well, I think he left it open
9 that he may address new information as it becomes
10 available to him, as all the experts have.
11 MR. ASSAAD: So what's your objection?
12 MR. GOSS: Well, that you're closing the
13 door on him, and I think we intended to leave it open.
14 Q. Dr. Kuehn, would you agree with me that your
15 report contains all the opinions you intend to offer
16 to the court and to the jury in this matter that
17 you're aware of at this time on the day of your
18 deposition?
19 **A. At this time of day, yes.**
20 Q. Okay. Sitting here today at this point in
21 time, on July 10th, 2017 at 10:02 a.m., is there
22 anything that you want to add to your report or delete
23 from your report with respect to your opinions that
24 you will give in this case?
25 **A. Not at this time.**

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1 Q. Okay. And you understand that I'm one of
2 the attorneys working on behalf of over 2,000 people
3 who have filed lawsuits alleging that they have been
4 harmed by the Bair Hugger. You understand that;
5 correct?
6 **A. I have heard that, yes.**
7 Q. Okay. And --
8 But you understand that; correct?
9 **A. Yes.**
10 Q. Okay. And you understand that the
11 plaintiffs have a legal right to understand the full
12 scope of your opinions in this case.
13 **A. I believe so, yes.**
14 Q. Okay. We also have the right to know all
15 the methodologies as to how you reached your opinions.
16 Do you understand that?
17 **A. Yes.**
18 Q. Now in reading your report, my understanding
19 is that your two main opinions are that the filter
20 that was selected for the Bair Hugger is appropriate
21 and that the Bair Hugger does not disrupt the airflow
22 in the operating room; is that correct?
23 **A. Those are two main opinions, yes.**
24 Q. Okay. And now looking at your report, you
25 reviewed the -- the reports of Dan Koenigshofer, Said

9 (Pages 33 to 36)

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1 Elghobashi, Michael Buck, Yadin David, William Jarvis
2 and Michael Stonnington; correct?
3 **A. That's correct.**
4 Q. And your rebuttal to those expert reports of
5 the plaintiffs' experts are contained from page nine
6 to page 16; correct?
7 **A. That's correct.**
8 Q. And with respect to pages one through eight,
9 those were the issues that you were asked to address
10 by the defendant that we talked about earlier;
11 correct?
12 **A. Including the top of page nine, yes.**
13 Q. Okay. Do you recall receiving a subpoena in
14 this case?
15 **A. Yes, I do.**
16 Q. Okay. Did you produce all the documents
17 requested in the subpoena to Blackwell Burke?
18 **A. If I could take a look at the subpoena**
19 **again, I could answer that.**
20 **(Kuehn Exhibit 3 was marked for**
21 **identification.)**
22 BY MR. ASSAAD:
23 Q. Exhibit 3 is a subpoena issued on June 7th,
24 2017 to Dr. Kuehn in this case. Do you recall
25 receiving this subpoena?

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1 **A. Yes, I do.**
2 Q. Now before we get to the subpoena, did you
3 create any notes, handwritten notes in this case?
4 **A. I did.**
5 Q. Okay. Were they notes that you created
6 while you were formulating your opinions?
7 **A. Yes.**
8 Q. Did you also create notes with regard --
9 with respect to conversations you had with counsel?
10 **A. Yes.**
11 Q. Okay. Are they on a separate notebook or on
12 the same notebook?
13 **A. Same notebook.**
14 Q. Okay. Do you have that notebook here with
15 you today?
16 **A. I do not, no.**
17 Q. Did you bring anything with you today?
18 **A. I did not.**
19 Q. Why not?
20 **A. My impression was that the opposing attorney**
21 **would provide all the documents necessary.**
22 Q. Well if -- if you have an article that may
23 support your opinion that you want to refer to,
24 wouldn't it be helpful if you had it here today when
25 you're expressing all your opinions today?

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1 MR. GOSS: Object to form.
2 **A. If I had to dig down into the details and --**
3 **and go back and look at where I obtained some of my**
4 **information, that would be helpful.**
5 Q. Okay. So you agree with me it would be
6 helpful.
7 **A. Yes.**
8 Q. Okay. So it's clear that you have --
9 Do you have notes that you created on a
10 computer, like on a Word document or Excel sheet?
11 **A. I do not.**
12 Q. Okay. They're all handwritten notes --
13 **A. Yeah.**
14 Q. -- that you created?
15 Okay. Let's go through the subpoena. If
16 you go to page four of Exhibit 3, --
17 Page four.
18 **A. Uh-huh.**
19 Q. -- do you recall seeing this list of
20 documents to be produced, items one through 18?
21 **A. I have.**
22 Q. Did you go through all the list and produce
23 documents to your counsel?
24 **A. I did.**
25 Q. Okay. Did you produce your notes to your

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1 counsel?
2 **A. I did.**
3 Q. You produced your invoices; correct?
4 **A. Yes.**
5 Q. Number one, "All documents reviewed by the
6 deponent in anticipation or in preparation for this
7 deposition." Did you produce those to your counselor?
8 **A. I did.**
9 Q. What documents were those?
10 **A. Those include the -- some of the papers I**
11 **found online that I mentioned before, the books I used**
12 **as reference books, and also the -- the documents**
13 **provided by -- by counsel.**
14 Q. Okay. If you go to Exhibit E of Exhibit 1,
15 which is a list of the materials considered, is there
16 anything on that list that you provided to -- that are
17 responsive to item number one of Exhibit 3 that is not
18 on this list?
19 **A. Anything I provided that's not on the list,**
20 **is that the question?**
21 Q. Yes.
22 **A. I think that covers everything.**
23 Q. Okay. So you haven't reviewed anything
24 besides what's on this list in preparation for your
25 deposition or anticipation of litigation.

10 (Pages 37 to 40)

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<p>1 A. I don't believe so.</p> <p>2 Q. Okay.</p> <p>3 MR. GOSS: I think he said --</p> <p>4 MR. ASSAAD: I'm going to get there in a</p> <p>5 second. We're going.</p> <p>6 MR. GOSS: Okay.</p> <p>7 Q. Besides the Stocks document, correct?</p> <p>8 A. Yes.</p> <p>9 Q. Okay. Any other documents that were</p> <p>10 provided to you by counsel except the Stocks document</p> <p>11 provided on Friday that you reviewed?</p> <p>12 A. That's -- that's not on this list; --</p> <p>13 Q. Yes.</p> <p>14 A. -- correct?</p> <p>15 That's the only one I can think of.</p> <p>16 Q. Did --</p> <p>17 Were there any documents that you reviewed</p> <p>18 on Friday that's on this list?</p> <p>19 A. I think there was a 3M data test report by</p> <p>20 Winston Tan, which is about midway down on the first</p> <p>21 page of Exhibit E.</p> <p>22 Q. And that's the filter testing; correct?</p> <p>23 A. Yes.</p> <p>24 Q. Okay. Anything else?</p> <p>25 A. Those were the two that we looked at on --</p>	<p>1 A. Okay.</p> <p>2 Q. Is that the only time you've ever designed a</p> <p>3 filter-type like device?</p> <p>4 A. That's my recollection, yes.</p> <p>5 Q. Okay. With respect to number two, are there</p> <p>6 any correspondence between you and anyone besides</p> <p>7 Blackwell Burke or any of the attorneys from 3M?</p> <p>8 A. No.</p> <p>9 Q. Okay. How many pages of notes do you have?</p> <p>10 A. Perhaps 30 or 40.</p> <p>11 Q. Thirty or 40 pages. And you gave them to</p> <p>12 Mr. Goss?</p> <p>13 A. I did.</p> <p>14 Q. When did you give it to him?</p> <p>15 A. A few weeks ago.</p> <p>16 Q. Okay. And out of those 30 or 40 pages, how</p> <p>17 many pages dealt with actual conversations you had</p> <p>18 with Mr. Goss?</p> <p>19 A. Maybe one or two.</p> <p>20 Q. One or two pages. Okay.</p> <p>21 With respect to the conversations you had</p> <p>22 with Mr. Goss, were there any facts that you relied</p> <p>23 upon in formulating your opinions?</p> <p>24 A. I would -- I would answer that as -- as no.</p> <p>25 All -- all the facts I developed myself --</p>
Page 42	Page 44
<p>1 on Friday.</p> <p>2 Q. Have you ever designed a filter?</p> <p>3 A. I have not designed a filter from scratch,</p> <p>4 no.</p> <p>5 Q. Okay. Well when you say you haven't</p> <p>6 designed a filter from scratch, have you done any type</p> <p>7 of design of a filter?</p> <p>8 A. Yes.</p> <p>9 Q. What?</p> <p>10 A. I helped design a device that would behave</p> <p>11 as a filter but is not using normal fibrous media, but</p> <p>12 the output would be the same or very similar to a</p> <p>13 fibrous-media filter.</p> <p>14 Q. What was that, a synthetic media?</p> <p>15 A. It was actually using three parallel-stage</p> <p>16 impactors that could be put into an ASHRAE 52.2 test</p> <p>17 facility such that it could be replicated very</p> <p>18 precisely, used in different laboratories to help</p> <p>19 inter -- interlaboratory test results to assume they</p> <p>20 were more uniform -- to make them more uniform.</p> <p>21 Q. You need to speak up a bit for the camera</p> <p>22 though.</p> <p>23 A. Okay.</p> <p>24 Q. Because I'm having trouble hearing you,</p> <p>25 so --</p>	<p>1 Q. Okay.</p> <p>2 A. -- or -- or found in the literature or</p> <p>3 other -- other materials provided to me.</p> <p>4 Q. So all the facts that you relied upon are</p> <p>5 contained in your report and in Exhibit E of</p> <p>6 Exhibit 1.</p> <p>7 A. That's correct.</p> <p>8 Q. Okay. There's nothing that Mr. Goss --</p> <p>9 You never asked Mr. Goss a question with</p> <p>10 respect to a certain issue that you relied upon.</p> <p>11 A. Not without getting some other documentation</p> <p>12 that would satisfy my question.</p> <p>13 Q. Such as?</p> <p>14 Did you ask a question of Mr. Goss and he</p> <p>15 provided you information through a document?</p> <p>16 A. I asked about how a typical Bair Hugger</p> <p>17 setup would -- would be used in a -- or how it would</p> <p>18 be set up in an operating room, and I was provided</p> <p>19 photographs of how -- how the Bair Hugger would be set</p> <p>20 up in a typical patient.</p> <p>21 Q. So he provided you photographs.</p> <p>22 A. Yes.</p> <p>23 Q. Okay. Where are those photographs? Are</p> <p>24 they listed in Exhibit E?</p> <p>25 A. No, they're not.</p>

11 (Pages 41 to 44)

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<p>1 Q. Okay. Did you produce them back to Doc --</p> <p>2 Mr. Goss in response to your exhibit -- or in response</p> <p>3 to the subpoena, Exhibit 3?</p> <p>4 A. They were provided me on Friday.</p> <p>5 Q. They were provided to you on Friday.</p> <p>6 A. On Friday, yes.</p> <p>7 Q. So it's my understanding that you did -- you</p> <p>8 did not know how a Bair Hugger was set up in an</p> <p>9 operating room before this Friday, July 8th -- July</p> <p>10 7th, 2017.</p> <p>11 A. I wanted to have additional documentation</p> <p>12 that I had reviewed prior to coming here today that I</p> <p>13 could say, yes, I understand how a Bair Hugger is to</p> <p>14 be set up properly in an operating room.</p> <p>15 Q. And how many pictures did he send over to</p> <p>16 you?</p> <p>17 A. Approximately six.</p> <p>18 Q. Okay. And where were those pictures taken?</p> <p>19 A. I do not know.</p> <p>20 MR. GOSS: These are the draping pictures</p> <p>21 that Dr. Mont used in his Science Day presentation,</p> <p>22 and we can send them over.</p> <p>23 MR. ASSAAD: Can you please send over the</p> <p>24 notes as well?</p> <p>25 MR. GOSS: I will review that with the team.</p>	<p>1 expert witness on the case and not -- not being</p> <p>2 personally represented.</p> <p>3 Q. Okay. So now we know you have notes on --</p> <p>4 with respect to the item number four of Exhibit 3.</p> <p>5 There's notes -- there's handwritten notes on</p> <p>6 documents that you reviewed that you provided to</p> <p>7 counsel; correct?</p> <p>8 A. That's correct.</p> <p>9 Q. With respect to item number five, do you</p> <p>10 have any documents responsive to number five?</p> <p>11 A. You're referring back to the subpoena?</p> <p>12 Q. Yes.</p> <p>13 A. The -- the two papers I referred to earlier</p> <p>14 by Tsai and the -- the Dutch researchers, I have an</p> <p>15 electronic form on my computer. I do not recall if I</p> <p>16 have provided copies to counsel of those.</p> <p>17 Q. With respect to six and seven, "A list of</p> <p>18 all books" -- well strike that.</p> <p>19 With respect to item six of Exhibit 3, "A</p> <p>20 list of all books, treatises, and arti -- articles</p> <p>21 authored or co-authored by the deponent," that would</p> <p>22 be in your CV; correct?</p> <p>23 A. That's correct.</p> <p>24 Q. Okay. With respect to number seven, "A list</p> <p>25 of all books, treatises, articles, publications, or</p>
Page 46	Page 48
<p>1 That call was made when I was out of the country.</p> <p>2 Q. Did you rely on those notes to prepare</p> <p>3 your -- your report?</p> <p>4 A. I -- I did the background work in the -- in</p> <p>5 the notes and then used those to prepare the report,</p> <p>6 yes.</p> <p>7 Q. Okay. Now your report is -- your report is</p> <p>8 only 16 pages; correct?</p> <p>9 A. Well I should say the report and exhibits.</p> <p>10 Q. Okay. And you have 30 pages of notes at</p> <p>11 least.</p> <p>12 A. That's my approximation.</p> <p>13 Q. Was it on an engineering notebook pad or was</p> <p>14 it a regular like legal pad?</p> <p>15 A. It's on a bound engineering notebook.</p> <p>16 Q. Okay. Did you make any marks on any of the</p> <p>17 documents you reviewed in Exhibit E of Exhibit 1?</p> <p>18 A. Some of the documents provided by counsel I</p> <p>19 did.</p> <p>20 Q. Okay. Did you provide those to your</p> <p>21 counsel?</p> <p>22 A. I did.</p> <p>23 Q. Okay. By the way, are you being represented</p> <p>24 by Blackwell Burke today?</p> <p>25 A. My understanding is I'm here serving as an</p>	<p>1 materials which the deponent considers authoritative</p> <p>2 with regard to the deponent's opinions in this case,"</p> <p>3 would that be in Exhibit E of your report?</p> <p>4 A. I'm -- I'm sorry, I'm trying to follow</p> <p>5 where -- where you are.</p> <p>6 Q. Number seven.</p> <p>7 A. On which --</p> <p>8 Q. Page four of Exhibit 3, number seven. I'm</p> <p>9 going down the list.</p> <p>10 A. Okay, number seven. I provided everything</p> <p>11 that I used in preparing my -- my report, yes.</p> <p>12 Q. And you consider all those items</p> <p>13 authoritative.</p> <p>14 A. Yes.</p> <p>15 Q. Do you consider the ASHRAE manuals and --</p> <p>16 and papers authoritative?</p> <p>17 A. As engineering best practice, yes.</p> <p>18 Q. So you consider it authoritative.</p> <p>19 A. Yes.</p> <p>20 Q. Number 10 states, "An itemized list of time,</p> <p>21 charges, and expenses for services or opinions</p> <p>22 rendered in this case, including an itemization for</p> <p>23 said services performed by any person employed by the</p> <p>24 deponent in this case." Did you produce all those to</p> <p>25 your -- to counsel?</p>

12 (Pages 45 to 48)

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1 **A. As of early June I did, yes.**
 2 Q. Okay.
 3 **A. Not since then.**
 4 **(Kuehn Exhibit 4 was marked for**
 5 **identification.)**
 6 BY MR. ASSAAD:
 7 Q. Exhibit 4 I represent are three invoices
 8 provided to the plaintiffs in response to our subpoena
 9 to you. Do you recognize these three pages?
 10 **A. Yes, I do.**
 11 Q. You guess you do?
 12 **A. Yes, I do.**
 13 Q. Oh, yes, you do. I'm sorry. I thought you
 14 said "I guess I do."
 15 Okay. Are you aware that out of all the
 16 documents that we have been talk -- discussing, that
 17 these are the only three pages provided by your
 18 counsel in response to the subpoena to plaintiffs?
 19 **A. I have no idea of that.**
 20 Q. Okay. All right. You mentioned you spent
 21 an hour doing independent research. Where is that on
 22 any of these invoices that you did in the beginning of
 23 the case?
 24 **A. I think I submitted an invoice for the month**
 25 **of March, which is not included in here, which may**

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1 of July, to your recollection?
 2 **A. I have not billed anything since this.**
 3 Q. How many hours have you worked on this case
 4 in the month of July?
 5 **A. I would estimate maybe 15 to 20.**
 6 Q. Fifteen. And that was in the preparation of
 7 your deposition; correct?
 8 **A. I don't recall when I actually submitted**
 9 **the -- the expert report, if that included July or if**
 10 **that was done in June. I do not know if the July time**
 11 **included any expert-report preparation or if it's**
 12 **simply preparing for the deposition.**
 13 Q. Well I state for the record that your
 14 expert re --
 15 Well if you look at Exhibit 1, your expert
 16 report was signed on June 1st, 2017.
 17 **A. Okay. Then -- then I did not spend time on**
 18 **the expert report in July. I was simply preparing for**
 19 **the deposition.**
 20 Q. Okay. So the whole time in July, all the
 21 hours you worked on this case and will submit to
 22 defense counsel was in preparation of your deposition;
 23 correct?
 24 **A. And also reviewing the report and -- yes.**
 25 Q. Your report.

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1 **have in -- included that. Or perhaps when I'm saying**
 2 **"Continue work on expert report," that may have**
 3 **included some -- some online searching for**
 4 **documents --**
 5 Q. Okay.
 6 **A. -- in the -- in the April invoice.**
 7 Q. So these are not all the invoices you -- you
 8 have created in this case.
 9 **A. I recall submitting one for the month of**
 10 **March, which I do not see here.**
 11 Q. Do you remember how many hours that was?
 12 **A. I do not remember off the top of my head.**
 13 Q. Okay. And the last invoice you have is
 14 invoice date of July 12th for the month of June;
 15 correct?
 16 **A. I think that may be a -- an incorrect date.**
 17 **That may have been June 12th --**
 18 Q. Okay.
 19 **A. -- instead of --**
 20 **Yeah. If you look up in the first line it**
 21 **says 6/1/2017.**
 22 Q. Okay. Have you provided any other invoices
 23 since then?
 24 **A. I have not.**
 25 Q. How many hours have you billed for the month

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1 **A. Yes.**
 2 Q. You haven't read any other reports in
 3 preparation for this deposition; correct?
 4 **A. Yes. I --**
 5 **Well no -- no defense reports.**
 6 Q. You reviewed some of the plaintiffs'
 7 reports?
 8 **A. Yes.**
 9 Q. Whose?
 10 **A. Koenigshofer's, I don't remember when I did**
 11 **that, Buck, Elghobashi. Those are the main three.**
 12 **Also reviewed a few others.**
 13 MR. GOSS: Are you asking just in July?
 14 MR. ASSAAD: In preparation for today's
 15 deposition.
 16 **A. I think there's a total of maybe six or**
 17 **seven I looked at altogether.**
 18 Q. Do you know Dr. Elghobashi?
 19 **A. I've heard of him. I do not know him.**
 20 Q. Okay. Have you ever heard of the Elghobashi
 21 Map?
 22 **A. I have not heard of that.**
 23 Q. Okay. Do you know what coupling is with
 24 respect to particle movement?
 25 **A. I -- I would say I -- prob --**

13 (Pages 49 to 52)

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1 **Probably not.**
 2 Q. Okay. Do you know who Lagrange is?
 3 **A. Yes.**
 4 Q. And Mueller?
 5 **A. Yes.**
 6 Q. Have you ever heard the term boussinesq?
 7 **A. Yes.**
 8 Q. What's your understand -- what's your
 9 understanding of boussinesq?
 10 **A. It's a simplified approximation for -- for**
 11 **fluid mechanics.**
 12 Q. With respect to what?
 13 **A. I believe it's assuming the fluid properties**
 14 **are constant.**
 15 Q. Excuse me?
 16 **A. Assuming the fluid properties are constant.**
 17 Q. What property of fluids?
 18 **A. I think it's both density and viscosity.**
 19 Q. When is the last time you used the
 20 boussinesq approach in solving problems?
 21 **A. It's probably a long time ago, maybe 20 --**
 22 **20 years ago.**
 23 Q. Do you know the limitations of the
 24 boussinesq approach?
 25 **A. I know they're not valid when there's large**

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1 **temperature gradients, which -- which changes both**
 2 **density and viscosity.**
 3 Q. What would you consider a large temperature
 4 gradient?
 5 **A. In -- in -- mostly in -- in liquids, because**
 6 **the viscosity is much stronger a function of**
 7 **temperature than it is of, say, gases.**
 8 Q. I understand. But what would you consider a
 9 large temperature gradient?
 10 **A. In liquids, for example in water, maybe**
 11 **something more than 20 or 30 degrees Fahrenheit.**
 12 Q. How about gas?
 13 **A. Gas is a probably much higher temperature**
 14 **because the viscosity and density are not nearly as --**
 15 **as temperature-dependent. I would say maybe 50 to a**
 16 **hundred.**
 17 Q. Okay. Is that a guess or is that based
 18 on --
 19 **A. That's --**
 20 Q. -- any document or research that you've
 21 done?
 22 **A. That's -- that's an estimate based on my**
 23 **experience.**
 24 Q. Can you point me to a literature or
 25 peer-reviewed article that supports that statement?

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1 **A. I could probably find documentation of that**
 2 **in a -- a good fluid mechanics textbook.**
 3 Q. Okay.
 4 MR. GOSS: We've been going about an hour.
 5 Do you want to take a quick break?
 6 MR. ASSAAD: Give me five minutes.
 7 MR. GOSS: No problem.
 8 Q. Do you know Dan Koenigshofer?
 9 **A. I do not.**
 10 Q. Do you know Michael Buck?
 11 **A. I may have run across him at the university,**
 12 **but no, I really don't know him.**
 13 Q. He works with Andy Streifel. Do you know
 14 him?
 15 **A. I do know Andy, yes.**
 16 Q. Do you know him very well?
 17 **A. Reasonably well. We've worked together from**
 18 **time to time in the past.**
 19 Q. Okay. With respect to using the boussinesq
 20 approach, are you aware of what ANSYS, Fluent or CFX
 21 states in their manuals with respect to using that
 22 approach?
 23 **A. I do not know that.**
 24 Q. Okay. Would you be surprised that they
 25 consider a gradient greater than three or four degrees

Page 56

1 Celsius with respect to using particle flow, that that
 2 would be too large of a gradient with respect to using
 3 the boussinesq approach?
 4 **A. Based on my experience, that seems to be**
 5 **overly restrictive.**
 6 Q. Okay. When is the last --
 7 Well your experience has been over 25 years
 8 using the boussinesq approach; correct?
 9 **A. Yes.**
 10 Q. With respect to item number nine on Exhibit
 11 3, the subpoena, there's no engagement agreement
 12 between you and Blackwell Burke or 3M; correct?
 13 **A. Can you define "engagement agreement?"**
 14 Q. No written document or contract between you
 15 two.
 16 **A. It's -- it's a verbal agreement.**
 17 Q. Okay. Do you have any correspondence at all
 18 with either defense counsel or anyone else in this
 19 case? And that includes e-mails.
 20 **A. There are some e-mail correspondence between**
 21 **myself and counsel.**
 22 Q. Okay. But no one else besides counsel.
 23 **A. No.**
 24 Q. Besides the six photographs that were
 25 provided to you on Friday, five or six photographs,

14 (Pages 53 to 56)

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1 any other photographs provided to you?
 2 **A. Not other than the ones that are included in**
 3 **one of my exhibits.**
 4 Q. Okay. Who took those pictures in the
 5 exhibits?
 6 **A. Oh, it was either Peter or -- or Vinita.**
 7 Q. Who is Vinita?
 8 **A. Vinita is one of the lawyers in Blackwell**
 9 **Burke's office.**
 10 MR. GOSS: She's an associate in my office.
 11 MR. ASSAAD: Okay.
 12 MR. GOSS: She will be here later, after
 13 lunch.
 14 MR. ASSAAD: Okay.
 15 Q. Was anyone else in the room in Exhibit D?
 16 **A. No, just the three of us.**
 17 Q. Okay. Where -- where did that Exhibit D,
 18 where did that occur?
 19 **A. That occurred in the 3M laboratory.**
 20 Q. Okay. So it happened in a 3M laboratory
 21 in --
 22 **A. Yes.**
 23 Q. -- St. Paul?
 24 **A. Yes.**
 25 Q. Okay. I take it you had no communications

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1 Q. Okay. Discovery has been closed in this
 2 case for a few months now; correct? Are you aware of
 3 that?
 4 **A. I -- I'm not aware of the legal terms, no.**
 5 Q. Okay. Is there anything specific with
 6 respect to patients that would change your opinions in
 7 this case?
 8 **A. Could you re -- repeat the question?**
 9 Q. Well you talked about getting new
 10 information, you know, you might ask to be -- offered
 11 some potential new information, so I'm trying to
 12 figure out what type of information might affect your
 13 opinions. So my first question is: Anything specific
 14 to a patient's medical records that might affect or
 15 change your opinions in this case?
 16 **A. I -- I'm going under the assumption that the**
 17 **only additional information provided would be, for**
 18 **example, a deposition from someone.**
 19 Q. Okay. What in a deposition might affect
 20 your opinions in this case?
 21 **A. It's difficult for me to say without reading**
 22 **the deposition.**
 23 Q. Okay. Do you feel that you have all the
 24 information necessary to support your opinions in this
 25 case?

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1 with any other experts in this case, defense experts.
 2 **A. I have not communicated with anybody other**
 3 **than defense -- other than counsel I should say.**
 4 Q. Is there any agreements for you to perform
 5 any other work in this case besides formulating your
 6 opinions that are outlined in Exhibit 1 and 2?
 7 **A. I would anticipate as additional information**
 8 **becomes available I would be asked to perform**
 9 **additional services.**
 10 Q. Such as what additional information?
 11 **A. Perhaps reviewing additional depositions or**
 12 **other -- other documents that may come forward.**
 13 Q. Are you aware that general causation
 14 discovery is closed in this case?
 15 Do you know what that means?
 16 **A. I -- I'm not -- not aware of that.**
 17 Q. You know what general --
 18 You know what discovery is; correct?
 19 **A. Yes.**
 20 Q. You're familiar with lawsuits; correct?
 21 **A. Yes.**
 22 Q. Have you ever been sued yourself?
 23 **A. No.**
 24 Q. Have you ever sued anybody?
 25 **A. No.**

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1 **A. I think I do.**
 2 Q. Okay. You -- you agree that the good
 3 engineering approach in attacking an issue is to study
 4 the issue extensively; correct?
 5 **A. Engineers always have restrictions on time**
 6 **and resources, so one does the best one can under the**
 7 **existing circumstances.**
 8 Q. Did you have any restrictions on your time
 9 by 3M or Blackwell Burke?
 10 **A. I did not.**
 11 Q. So you could have spent as much time as you
 12 want or you felt necessary to research the issues in
 13 this case; correct?
 14 **A. That's correct.**
 15 Q. Okay. Could you -- would --
 16 Could you have asked a graduate student or
 17 a -- a researcher to assist you in this case?
 18 **A. I didn't think that was appropriate.**
 19 Q. Why not?
 20 **A. Because I was the one retained as an expert**
 21 **witness and not a -- not a graduate student.**
 22 Q. I understand that. But you've also written
 23 many papers and used graduate students to help you do
 24 the research; correct?
 25 **A. Yes, but that's not a litigation process.**

15 (Pages 57 to 60)

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1 Q. But you rely on -- on your graduate
2 students; correct?
3 A. For the research they do in the laboratory,
4 yes.
5 Q. Or to do any type of research review;
6 correct?
7 A. Under my direction, yes.
8 Q. For example, when you attack a new problem,
9 you want to review and obtain all the peer-reviewed
10 literature, relevant literature on that issue to see
11 what other people have done; correct?
12 A. As much as is reasonably possible, yes.
13 Q. Did you do that in this case?
14 A. Other than some keyword searches, I did not
15 do a very exhaustive search, no.
16 Q. You relied on what 3M provided you; correct?
17 A. That, and some of the work -- some of the
18 searching I did on my own.
19 Q. Well what we talked about today, those two
20 articles; correct?
21 A. Those were the two that I thought were the
22 most relevant to support my opinions.
23 Q. What other articles did you think that were
24 relevant but not the most relevant?
25 A. There were a number of articles on particle

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1 deposition, particle removal, filtration that I didn't
2 think were as relevant, so I did not include them.
3 Q. With respect to the use of the Bair Hugger
4 and its effect on the environment, did you review any
5 articles of that nature?
6 A. I don't believe I did, other than what was
7 provided.
8 Q. Okay. You relied on 3M to provide you those
9 articles; correct?
10 A. I relied on counsel to provide the articles.
11 Q. Well counsel represents 3M in this case.
12 You understand that; correct?
13 A. Yes.
14 Q. Okay. And you would expect that, being
15 retained as an expert in this case and being a
16 professor at the University of Minnesota, that 3M
17 would provide you with all the information necessary
18 to formulate your opinions; correct?
19 A. I --
20 That -- that's not the case. They provided
21 some of the material and I obtained other material
22 myself, some background material.
23 Q. Yeah. But if they were aware of information
24 that might be relevant to your opinions or could
25 affect your opinions, you'd expect 3M to provide you

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1 that information; correct?
2 A. I would expect that to be the case, yes.
3 Q. Okay. Because that would be --
4 I mean for you to be objective, you want to
5 know the good and the bad with respect to an issue
6 that is known in the scientific community; correct?
7 A. You want to know as much as possible, yes.
8 Q. To be objective.
9 A. Yes.
10 Q. Okay. Because you're not here to be an
11 advocate, you're here to be objective as an engineer
12 and pretty much black and white on the science;
13 correct?
14 A. I am --
15 MR. GOSS: Object to form.
16 A. -- here -- I'm here to defend the positions
17 that I have set forth.
18 Q. You're here to defend 3M's positions;
19 correct?
20 MR. GOSS: Object to form.
21 Q. Correct?
22 A. These are my positions I have put forth.
23 MR. ASSAAD: I think it's time for a break.
24 THE REPORTER: Off the record, please.
25 (Recess taken.)

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1 BY MR. ASSAAD:
2 Q. Dr. Kuehn, did you meet with anyone at 3M to
3 discuss this issue?
4 A. No, I did not.
5 Q. So you never met with like Michelle Stevens,
6 Al Van Duren, any one of --
7 Any of those names sound familiar?
8 A. No.
9 Q. Okay. Going back to Exhibit 4, my
10 understanding is that you believe there's a March
11 invoice and a May invoice that is not reflected in
12 Exhibit 4; correct?
13 A. That's my recollection. I thought I
14 submitted invoices every month up until the 1st of
15 June.
16 Q. Okay. Besides --
17 If you look at page three, besides your work
18 on June 1st, 2017 for one hour, do you recall any
19 other work you performed on this case in the month of
20 June?
21 A. Yes, yes, there was work done after this. I
22 believe the expert report, as -- as you mentioned, was
23 submitted about June 1st, so I was told to submit all
24 my invoices, all my time up to that date, which I did.
25 Q. Okay. My question is: Was there any other

16 (Pages 61 to 64)

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1 work you performed on this case in the whole entire
 2 month of June?
 3 **A. After June 1st, yes.**
 4 Q. What work?
 5 **A. I would say probably reading -- reading**
 6 **depositions that were provided by counsel.**
 7 Q. My understanding is that the deposition of
 8 Jim Ho was provided to you on Friday; correct?
 9 **A. That's correct.**
 10 Q. Okay. So you didn't do that work in June;
 11 correct?
 12 **A. No.**
 13 Q. Okay. I'm asking for the month of June, --
 14 **A. Yes.**
 15 Q. -- any other work that was performed on this
 16 case.
 17 **A. I -- I can't recall specifics off the top of**
 18 **my head.**
 19 Q. Okay. What other depositions besides Jim
 20 Ho's deposition was provided to you?
 21 **A. Koenigshofer's and Zgoda's, Karl Zgoda,**
 22 **Elghobashi's. Those are the ones that come to mind.**
 23 Q. Okay. And also Mr. Crowder?
 24 **A. I think I reviewed his expert report, but I**
 25 **don't think I recall seeing his --**

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1 Q. Well he's not an expert in this case. He
 2 was deposed. He's the person with Pentair.
 3 **A. Then -- then I must have seen his -- his**
 4 **deposition.**
 5 Q. I believe you put it -- you put it down on
 6 Exhibit E of Exhibit 1.
 7 **A. Okay. Then -- then that must be correct.**
 8 Q. Okay. So when did you receive Dr.
 9 Elghobashi's deposition?
 10 **A. I can't say for sure. Probably maybe six**
 11 **weeks ago.**
 12 Q. Okay. Well his deposition was taken on June
 13 15th, --
 14 **A. Okay.**
 15 Q. -- so it had to have been after that.
 16 **A. Okay.**
 17 Q. Okay. You said you also received Dan
 18 Koenigshofer's deposition; correct?
 19 **A. Yes.**
 20 Q. And did you receive Michael Buck's
 21 deposition?
 22 **A. Yes.**
 23 Q. Okay. Did you receive Dr. Ulatowski's
 24 deposition?
 25 **A. No.**

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1 Q. Did you read the entire deposition of Dr.
 2 Elghobashi?
 3 **A. I have not read the entire deposition, no.**
 4 Q. Have you read the entire deposition of -- of
 5 Dan Koenigshofer?
 6 **A. Yes, I have.**
 7 Q. Have you read the entire deposition of
 8 Michael Buck?
 9 **A. Yes, I have.**
 10 Q. Have you read the entire deposition of Jim
 11 Ho?
 12 **A. Yes, I have.**
 13 Q. Were there any parts of the deposition that
 14 you were asked to review?
 15 **A. Not specifically. I was asked --**
 16 **Well, I took it upon myself to read the**
 17 **entire deposition of those -- those four.**
 18 Q. Okay. And I assume you've read the entire
 19 reports of Dr. Elghobashi, Dr. David, Dr. Stonnington
 20 and Dr. Samet; correct?
 21 **A. There were a number of reports given to me**
 22 **several months ago, so I -- I can't recall exactly**
 23 **which ones.**
 24 Q. Okay.
 25 **A. But those -- those sound correct.**

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1 Q. When you received the report, did you read
 2 the entire report?
 3 **A. Reviewed, at least -- at least glanced**
 4 **through the entire report, yes.**
 5 Q. When you use the term "glance," what -- what
 6 does "glance" mean to you?
 7 **A. Take a -- a first look through all of it,**
 8 **and then some of them I went back and -- and read in**
 9 **more detail.**
 10 Q. Okay. And -- and are the hours spent with
 11 respect to your work on Exhibit 4 accurate?
 12 **A. With -- with the exception of the perhaps**
 13 **two missing invoices, yes.**
 14 Q. I understand that. But when you say you
 15 spent one hour doing something, it was actually an
 16 hour and not two hours, three hours.
 17 **A. I try to be very -- very correct about that.**
 18 Q. Because that's what engineers do, they -- we
 19 try to be accurate; correct?
 20 **A. That's correct.**
 21 Q. Okay. You're a member the American Society
 22 of Mechanical Engineers; correct?
 23 **A. Yes.**
 24 Q. And you're also a member of ASHRAE; correct?
 25 **A. Yes.**

17 (Pages 65 to 68)

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1 Q. Okay. So just to be clear, on page two of
2 Exhibit 4, on April 8th it states that you spent one
3 hour on the expert reports from Samet, Stonnington,
4 Jarvis and David. Do you see that?
5 **A. I see that.**
6 Q. Okay. So it's my understanding you spent
7 one hour reviewing those four expert reports; correct?
8 **A. As I said, I -- I did not -- probably did**
9 **not read any of them in -- in great detail.**
10 Q. Okay. On April 8th it also states "expert
11 report from Elghobashi and drafted rebuttal," one
12 hour; correct?
13 **A. Yes.**
14 Q. What part of his report -- is the --
15 Is the rebuttal aspect of Elghobashi what
16 you have in your report here in Exhibit 1?
17 **A. That -- that was the beginning of that, yes.**
18 Q. Okay. Do you agree that Dr. Elghobashi is
19 an expert in the field of particle flow?
20 **A. I --**
21 **Again, I don't know him very well, so I -- I**
22 **really have no opinion on that.**
23 Q. Have you read any of his papers?
24 **A. I don't believe I have.**
25 Q. Okay. You've never heard of the Elghobashi

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1 **A. I have no opinion on that.**
2 Q. Okay. Are you familiar with the
3 supercomputer at the University of Minnesota?
4 **A. Yes.**
5 Q. How many cores does it have?
6 **A. I -- I don't know. I have not used that for**
7 **many years.**
8 Q. Okay. Are you aware that the license that
9 the University of Minnesota has for ANSYS is not
10 licensed for research work?
11 **A. Could you repeat the question?**
12 Q. Are you aware that the license for --
13 that -- the license as used at -- that the University
14 of Minnesota has for the use of ANSYS is not licensed
15 for research work?
16 **A. I -- I'm not aware of that, no.**
17 Q. Okay. And in fact it's also supposed to be
18 used for students enrolled in classes that use ANSYS,
19 or instructors and TAs involved in the course that
20 makes use of ANSYS software products.
21 **A. That -- that could be the case. I do not**
22 **know.**
23 **(Kuehn Exhibit 5 was marked for**
24 **identification.)**
25 BY MR. ASSAAD:

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1 Map; correct?
2 **A. I --**
3 **No, I have not.**
4 Q. So sitting here today you have no idea what
5 the Elghobashi Map refers to.
6 MR. GOSS: Are you saying "map?"
7 MR. ASSAAD: Map.
8 MR. GOSS: Okay.
9 **A. I do not.**
10 Q. Okay. Do you know what DNS is?
11 **A. Yes.**
12 Q. What's DNS?
13 **A. Direct Numerical Simulation.**
14 Q. Do you have access to any DNS software?
15 **A. I think at the University I probably do.**
16 Q. Okay. What software would that be?
17 **A. I -- I do not know.**
18 Q. Okay. Have you used any DNS software?
19 **A. I have not used any myself, no.**
20 Q. Do you agree that DNS software is more
21 advanced than ANSYS, Fluent or CFX?
22 **A. That -- that's my understanding.**
23 Q. Okay. And it's also your understanding that
24 very few supercomputers in the world could actually
25 use DNS.

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1 Q. What's been marked as Exhibit 5 is a copy of
2 a page of the website. If you look at the bottom
3 page, left, it gives you the web address, and if you
4 look at the upper left-hand corner it says the date
5 that this was copied off of the website. Do you
6 recognize Exhibit 5?
7 **A. I have not seen this before, no.**
8 Q. Do you know what CSE-IT stands for?
9 **A. I believe CSE stands for College of Science**
10 **and Engineering --**
11 Q. Yes.
12 **A. -- and IT is probably Information**
13 **Technology. But that's --**
14 **I'm fairly sure about CSE; I'm making a**
15 **guess at IT.**
16 Q. Do you agree with me that, based on your
17 knowledge today, that this is a page taken from the
18 University of Minnesota website?
19 **A. It appears to be, yes.**
20 Q. Okay. And on top it talks about "ANSYS
21 License."
22 **A. Yes.**
23 Q. Okay. Do you see where it says under "ANSYS
24 License," "This copy of Ansys is NOT LICENSED FOR
25 RESEARCH WORK?"

18 (Pages 69 to 72)

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1 **A. I see that.**

2 Q. And if you look at the bottom paragraph, it
3 says, "Access can be granted for use by students
4 enrolled in classes that use ANSYS or instructors and
5 TAs involved in the courses that make use of the ANSYS
6 software products?"

7 **A. I see that.**

8 Q. So you agree with me that under the license
9 agreement, based on this document, that no one should
10 be able to use ANSYS for any type of commercial work;
11 correct?

12 MR. GOSS: Object to form, lacks foundation.

13 **A. Repeat the question.**

14 Q. Well let's back up. I mean you've been in
15 academia for how many years, 30, 40 years?

16 **A. About 40 years.**

17 Q. Okay. And you're aware that companies will
18 give academic licenses to the university for -- for a
19 reduced rate to -- to train students; correct?

20 **A. That's correct.**

21 Q. Okay. And part of the --

22 And many of the licenses that are granted to
23 the university are -- are not to be used for
24 commercial purposes; correct?

25 **A. That -- that's probably some license-**

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1 **A. Well it says "LICENSED" -- "NOT LICENSED FOR
2 RESEARCH WORK." I -- I would imagine one would have
3 to interpret what that would mean.**

4 Q. Well it also says, "Access can be granted
5 for use by students enrolled in classes..." It --
6 it's not access for any type of commercial use.

7 **A. It says, "Access can be granted..." It says
8 access is restricted to.**

9 Q. Well let me ask you this: If you -- would
10 this license --

11 Based on your reading of this license, would
12 a -- would a professor or a student be allowed to do
13 research for 3M under this license?

14 **A. If -- if one were to define the term
15 "research" as indicated under here, then I would
16 agree.**

17 Q. Well how do you define "research?"

18 **A. Research is -- I would define as generating
19 new knowledge.**

20 Q. In formulating your report, did you read any
21 of the depositions of any of the fact witnesses?

22 **A. I'm not sure who the fact witnesses are.
23 If -- if you could identify --**

24 Q. Did you read any of the depositions by any
25 of the engineers at 3M?

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1 **agreement language, yes.**

2 Q. I mean you're familiar with that being in
3 academia for so many years; correct?

4 **A. Yes.**

5 Q. Okay. And companies do that because they
6 want students to become familiar with their products,
7 to use their products when they go out into the real
8 world; correct?

9 **A. I agree with that.**

10 Q. Okay. Because the cost for the license
11 for -- for an academic institution is much less than
12 the cost it would be for a private corporation.

13 **A. That -- that's what I have heard.**

14 Q. And in fact, when you --

15 When I was a student, and I'm sure your
16 students know, the cost of even getting Micro --
17 Microsoft Office as a student is much cheaper than
18 when you're not a student any more.

19 **A. There again, they're student versions, too,
20 that are much cheaper.**

21 Q. Yeah. So you agree with me that if anyone
22 used ANSYS for a commercial purpose, that would be in
23 violation of the ANSYS license with the University of
24 Minnesota; correct?

25 MR. GOSS: Object to form.

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1 **A. I don't believe so. But if you were to name
2 them, I could tell -- tell you "yes" or "no."**

3 Q. Karl Zgoda.

4 **A. Yes.**

5 Q. You've read his deposition.

6 **A. Yes.**

7 Q. Okay. What about Gary Hansen?

8 **A. I do not believe so.**

9 Q. What about Al Van Duren?

10 **A. No.**

11 Q. What about Michelle Hulse Stevens?

12 **A. No.**

13 Q. Are the only depositions you have read are
14 the ones outlined in Exhibit I on your report, as well
15 as the depositions that -- of -- of the plaintiffs'
16 experts provided to you by defense counsel?

17 **A. I believe that to be correct.**

18 Q. And Jim Ho, who is a defense expert.

19 **A. Yes.**

20 Q. Okay. Did you -- were you provided --
21 strike that.

22 Are you aware that there are about five to
23 eight peer-reviewed articles that discuss either
24 particle flow or disruption of the operating room
25 environment or filtration with respect to the Bair

19 (Pages 73 to 76)

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<p style="text-align: right;">Page 77</p> <p>1 Hugger?</p> <p>2 A. I do not know the exact number, but I -- I</p> <p>3 know there are some peer-reviewed publications, yes.</p> <p>4 Q. And the ones that you know about are the</p> <p>5 ones provided to you by defense counsel.</p> <p>6 A. I think that's correct.</p> <p>7 Q. Do you know who Dr. Sessler is?</p> <p>8 A. I have heard the name.</p> <p>9 Q. Before this litigation?</p> <p>10 A. No.</p> <p>11 Q. Okay. How have you heard the name?</p> <p>12 A. Just through discussions with counsel.</p> <p>13 Q. Okay. Have you read any of his peer-</p> <p>14 reviewed articles?</p> <p>15 A. I do not believe I have.</p> <p>16 Q. Do you know who Dr. McGovern is?</p> <p>17 A. I do not.</p> <p>18 Q. Do you know who Dr. Reed is?</p> <p>19 A. I have read one of his papers, but other</p> <p>20 than that, I do not know who he is.</p> <p>21 Q. The paper that was provided to you; correct?</p> <p>22 A. Yes.</p> <p>23 Q. Do you know who Mark Albrecht is?</p> <p>24 A. I --</p> <p>25 Prior to this --</p>	<p style="text-align: right;">Page 79</p> <p>1 Q. Okay. Did you review any of the depositions</p> <p>2 with respect to any of the study authors in this case?</p> <p>3 A. Could -- could you repeat that?</p> <p>4 Q. Are you aware that 3M took the depositions</p> <p>5 of many of the authors that had peer-reviewed</p> <p>6 literature that questioned the safety of the Bair</p> <p>7 Hugger device?</p> <p>8 A. I was not aware of those depositions, no.</p> <p>9 Q. Do you think reading those depositions would</p> <p>10 have been helpful in formulating your opinions?</p> <p>11 A. Possibly.</p> <p>12 Q. Do you know who Farhad Memarzadeh is?</p> <p>13 A. Again, I have heard the name. I do not know</p> <p>14 him personally.</p> <p>15 MR. GOSS: Memarzadeh.</p> <p>16 Q. Memarzadeh. Does that refresh your</p> <p>17 recollection when it's Memarzadeh?</p> <p>18 A. I still do not know him.</p> <p>19 Q. Okay. Are you aware that he's done</p> <p>20 computational fluid dynamic work with respect to</p> <p>21 operating rooms?</p> <p>22 A. I do not recall that.</p> <p>23 Q. Are you a member of the -- are you a member</p> <p>24 of the ASHRAE Rule 72 Committee?</p> <p>25 A. I'm not.</p>
<p style="text-align: right;">Page 78</p> <p>1 Q. Litigation.</p> <p>2 A. -- litigation, no.</p> <p>3 Q. But you've read some of his articles.</p> <p>4 A. Yes.</p> <p>5 Q. Do you know who Dr. Belani is?</p> <p>6 A. No.</p> <p>7 Q. Do you know Dr. Belani used to be the chair</p> <p>8 of anesthesiology at the University of Minnesota?</p> <p>9 A. I was not aware of that, no.</p> <p>10 Q. Did you --</p> <p>11 Were you provided with a deposition -- the</p> <p>12 corporate representative deposition of 3M in which it</p> <p>13 was 3M's -- well strike that.</p> <p>14 Do you know what a corporate deposition is?</p> <p>15 A. I -- I do not. Please educate me.</p> <p>16 Q. Okay. In litigation there's a deposition</p> <p>17 which you actually take the deposition of 3M and they</p> <p>18 provide a person to speak on behalf of 3M.</p> <p>19 A. Okay.</p> <p>20 Q. Did you read any of the depositions of any</p> <p>21 of the corporate representative depositions?</p> <p>22 A. Other than the one that I mentioned by Karl</p> <p>23 Zgoda, I don't believe I have.</p> <p>24 Q. Okay. Do you know who Nachtsheim is?</p> <p>25 A. I do not.</p>	<p style="text-align: right;">Page 80</p> <p>1 Q. Okay. Do you know what the Rule 72</p> <p>2 Committee is?</p> <p>3 A. I'm -- I'm not sure what the title of that</p> <p>4 would be.</p> <p>5 Q. Dealing with hospital rooms or -- and hos --</p> <p>6 and air -- hos -- healthcare facilities.</p> <p>7 A. That -- that's not --</p> <p>8 170 you say?</p> <p>9 Q. I'm sorry, 172.</p> <p>10 A. Yeah. No, I'm not a member of that.</p> <p>11 Q. Okay. You're a member of the 52 Committee;</p> <p>12 right?</p> <p>13 A. Actually, I'm not a member of 52, I'm a</p> <p>14 member of the technical committee that oversees</p> <p>15 Standards Committee 52.2.</p> <p>16 Q. Okay.</p> <p>17 (Discussion off the stenographic record.)</p> <p>18 Q. Now in reading your report, I just want to</p> <p>19 be clear so I understand you. Is -- is it your</p> <p>20 opinion that the Bair Hugger has no impact on the</p> <p>21 airflow environment of an operating room?</p> <p>22 A. I think my opinion would be somewhat more</p> <p>23 restrictive than that, that it has negligible effect</p> <p>24 on the airflow near the surgical site.</p> <p>25 Q. On the surgical</p>

20 (Pages 77 to 80)

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1 And when you say "negligible," what do you
2 mean by "negligible?"

3 **A. One would not be able to measure the**
4 **difference whether the Bair Hugger was being used or**
5 **not at the surgical site, everything else being equal.**

6 Q. Okay. Does it have an impact on the
7 unidirectional airflow?

8 **A. I would say no.**

9 Q. Okay. Does it have any impact in the
10 operating room with respect to airflow?

11 **A. I guess we would have to define "impact." I**
12 **would say it does circulate some of the air in one**
13 **portion of the operating room, behind the anesthesia**
14 **drape, but as -- as I said, I do not believe it would**
15 **have any significant effect of the airflow near the**
16 **surgical site.**

17 Q. And with respect to your filtration opinion,
18 it's your understanding that the filters used by 3M
19 are -- have a MERV 14 rating; correct?

20 **A. That's my understanding, yes.**

21 Q. Okay. And have you yourself done any
22 biological sampling of the bioburden in an operating
23 room?

24 **A. No, I have not.**

25 Q. Do you know what the bioburden in an

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1 Are you aware that Gary Settles took
2 temperature measurements when the Bair Hugger was in
3 use?

4 **A. I -- I do not recall that.**

5 Q. When you say you don't recall that, were
6 you --

7 You haven't seen his report; correct?

8 **A. I have not seen his report.**

9 Q. Were you ever informed that Gary Settles
10 took temperature measurements of the Bair Hugger
11 similar to what you did?

12 **A. I -- I do not remember that.**

13 Q. When you say you do not remember that, I
14 mean did you or did you not see it?

15 **A. I -- I can't recall.**

16 Q. Okay. Have you looked at Dr. Abraham's
17 report?

18 **A. I have not seen that.**

19 Q. Have you looked at his CFD analysis at all?

20 **A. I have not seen anything from John related**
21 **to this case.**

22 Q. Okay. Have you ever authored anything with
23 Dr. Abraham?

24 **A. I do not believe so, no.**

25 Q. Have you looked at any comments or materials

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1 operating room is?

2 **A. Not having worked in that area, I do not**
3 **know that.**

4 Q. Okay. Do you agree with me that to
5 determine the type of filter to be used and to
6 formulate an opinion on that, knowing what the
7 bioburden in an operating room is necessary?

8 **A. Well I do know this case is really focused**
9 **on bacteria-containing particles, and therefore my**
10 **opinion is based on the filter performance at that**
11 **type of particle and that particle size.**

12 Q. Okay. We'll get to that later on.

13 Did you request to see the expert reports
14 provided by the defense in this case?

15 **A. I -- I did not know what expert reports**
16 **there were, so they were provided to me by counsel.**

17 Q. So until you were provided the expert report
18 of Jim -- or the expert deposition of Jim Ho, you had
19 no idea that Jim Ho was retained by the defense in
20 this case?

21 **A. I had no idea.**

22 Q. And with respect to Gary Settles, you had no
23 idea that Gary Settles was an expert in this case?

24 **A. Prior to counsel mentioning that, no.**

25 Q. Sitting here today -- well strike that.

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1 from the CDC with respect to this case?

2 **A. I -- I do not believe I have, no.**

3 Q. Do you know what Schlieren testing is?

4 **A. I do.**

5 MR. ASSAAD: And Schlieren is spelled
6 S-c-h --

7 THE REPORTER: I know it.

8 MR. ASSAAD: Okay.

9 Q. Have you ever used Schlieren testing?

10 **A. Yes, I have.**

11 Q. When is the last time you used Schlieren
12 testing?

13 **A. Probably during my Ph.D. thesis work, maybe**
14 **40 years ago.**

15 Q. Okay. Have you seen any Schlieren testing
16 done by 3M?

17 **A. I have not.**

18 Q. Have you seen any Schlieren testing by any
19 of the defense experts?

20 **A. I have not seen any -- any Schlieren work**
21 **regarding this -- this case.**

22 Q. Do you know many people -- do you know --
23 Do you know whether or not many engineers
24 still use Schlieren testing?

25 **A. My understanding is that not very many.**

21 (Pages 81 to 84)

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<p style="text-align: right;">Page 85</p> <p>1 Q. They give you more of a qualitative result, 2 not a quantitative result; correct?</p> <p>3 A. You can actually get quantitative results 4 from Schlieren if it's set up properly.</p> <p>5 Q. Well when you say if it's set up -- set up 6 properly, what do you mean?</p> <p>7 A. I helped author a chapter in a textbook on 8 optical methods of temperature measurement, which 9 includes Schlieren method -- measurements.</p> <p>10 Q. So you can measure temperature by looking at 11 a Schlieren image?</p> <p>12 A. You can, yes.</p> <p>13 Q. Does it have to be a color image?</p> <p>14 A. Doesn't necessarily have to be color, it 15 could be gray scale.</p> <p>16 Q. Okay. Is it a -- is it a very complicated 17 mathematical equation?</p> <p>18 A. The procedure for getting the image is very 19 straightforward. Again, it would have to be 20 calibrated to actually back out appropriate 21 temperature data.</p> <p>22 Q. So it has to be set up properly; correct?</p> <p>23 A. Yes.</p> <p>24 Q. Does it use a different type of camera?</p> <p>25 A. You can use a standard optical camera.</p>	<p style="text-align: right;">Page 87</p> <p>1 that 3M gave you all the information necessary to 2 formulate your opinions?</p> <p>3 A. I would -- I would say they hopefully did 4 not withhold anything to support my opinion.</p> <p>5 Q. Well you haven't received any of the 6 depositions of the fact witnesses; correct?</p> <p>7 MR. GOSS: Object to form.</p> <p>8 Q. Except for Karl Zgoda.</p> <p>9 MR. GOSS: Object to form.</p> <p>10 A. As -- as -- as you outlined, yes.</p> <p>11 Q. Let's say it this way: There's many 12 depositions you have not reviewed in this case from 13 any of the fact witnesses in this case; correct?</p> <p>14 A. The fact witnesses that -- that you listed, 15 yes.</p> <p>16 Q. Yes. And you haven't received any of those 17 depositions of any of the study authors in this case; 18 correct?</p> <p>19 A. And the study authors are --</p> <p>20 Q. Albrecht, Reed, McGovern, Nachtsheim, 21 Belani.</p> <p>22 A. That's correct.</p> <p>23 Q. You haven't received any of the depositions 24 of -- the corporate representative depositions.</p> <p>25 A. Other than if you include Karl Zgoda's, no.</p>
<p style="text-align: right;">Page 86</p> <p>1 Q. Okay. Are you surprised, sitting here 2 today, that these other expert reports and testing 3 done of the Bair Hugger, they were not provided to 4 you?</p> <p>5 A. I -- I guess not knowing everything that's 6 out there, I -- no, I'm not surprised.</p> <p>7 Q. Well do you think it's strange that Gary 8 Settles did temperature measurements as well and that 9 information wasn't provided to you?</p> <p>10 MR. GOSS: Object to form.</p> <p>11 A. Actually, I think that may have been a -- a 12 wise decision to have two completely independent 13 people try to measure similar things.</p> <p>14 Q. And if they came up with the same result, 15 that would validate each other; correct?</p> <p>16 A. I think that would -- that would certainly 17 support each other, yeah.</p> <p>18 Q. What if they came up with different results?</p> <p>19 A. Then we'd have to look in -- in more detail 20 as to what the differences were in the setup or the 21 measurements.</p> <p>22 Q. Because the setup makes a difference; 23 correct? The way the experiment is set up; correct?</p> <p>24 A. And the -- and the instruments used, yes.</p> <p>25 Q. Okay. Sitting here today, do you believe</p>	<p style="text-align: right;">Page 88</p> <p>1 Q. That's not a corporate -- 2 I'm talking about the one done by Al Van 3 Duren.</p> <p>4 A. No, I have not seen those.</p> <p>5 Q. Do you think that if 3M admits that the Bair 6 Hugger -- every study that looked at whether or not 7 particles are increased over the surgical site by the 8 Bair Hugger, that it actually occurred, that would be 9 something important to know?</p> <p>10 MR. GOSS: Object to form.</p> <p>11 A. I don't know how they would approach that or 12 attribute that.</p> <p>13 Q. Well if 3M did a study and many other people 14 did a study and all the studies indicated that when 15 the Bair Hugger is turned on there were increased 16 particles over the surgical site, isn't that 17 information you would think would be relevant in 18 formulating your opinions?</p> <p>19 MR. GOSS: Same objection.</p> <p>20 A. I'm -- I'm -- I'm not sure I would agree 21 with that.</p> <p>22 Q. Well whether or not you agree with it or 23 not, do you agree that if peer-reviewed literature 24 done by 3M as well as others all indicate that 25 particles increase over the surgical site when the</p>

22 (Pages 85 to 88)

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1 Bair Hugger is turned on, that would be relevant
2 information and necessary information for you to know
3 in formulating your opinions?

4 MR. GOSS: Same objection.

5 **A. I am not sure that would be necessary**
6 **opinion -- or necessary information.**

7 Q. It would be relevant; correct?

8 **A. It would be relevant.**

9 Q. Okay. I mean you would want to look at the
10 test to see why the particles increased and what their
11 setup was and how the test was performed; correct?

12 MR. GOSS: Same objection.

13 **A. And in terms of measuring particles, there**
14 **are a lot of pitfalls involved with that.**

15 Q. Okay. So you don't believe in particle
16 testing?

17 **A. I believe in particle testing if -- if it's**
18 **done appropriately, but as I mentioned, there are many**
19 **pitfalls involved in performing correct aerosol**
20 **measurements.**

21 Q. I mean in fact you -- you -- you recommend
22 particle testing as an alternative in clean rooms;
23 correct?

24 MR. GOSS: Objection, vague.

25 **A. Say that again.**

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1 Q. Well you recommend, in -- in -- in -- in
2 determining whether or not a clean room is working
3 properly, as an alternative to doing biological
4 testing, that you could do particle testing.

5 **A. That's a protocol that's often used by some**
6 **manufacturers, yes.**

7 Q. And it's something that you've actually
8 recommended in papers before; isn't it?

9 **A. Yes.**

10 Q. Okay. Because I think you --

11 If I recall correctly, a room is not static,
12 it's dynamic; correct?

13 **A. Yes. Air is moving.**

14 Q. Okay. And there could be bursts in
15 particles that, even if you did a biological sampling,
16 you're not going to get any changes because of the
17 possible bursts in particles or -- as well as
18 biological bursts; correct?

19 **A. You -- you may miss a burst event.**

20 Q. And that's why particle monitoring is a good
21 alternative to biological sampling which takes days to
22 obtain the results.

23 **A. Well again, biological sampling gives you,**
24 **if it's done correctly, very good information, it's**
25 **just that the information is provided in a delayed**

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1 **manner.**

2 Q. At least one day.

3 **A. Usually at least one day for culturing, yes.**

4 Q. Exactly. And that's why an alternative
5 would be particle sampling, which could give you
6 real-time data, and you could actually set it up to
7 give you an alarm if it goes over a certain amount;
8 correct?

9 **A. You could do that, yes.**

10 Q. And that's something you've recommended in
11 the past.

12 **A. I'm not sure I have recommended that.**
13 **Certainly not for operating rooms.**

14 Q. Well you --
15 Well for clean rooms.

16 **A. That -- that's possible, yes.**

17 Q. Okay. Well you've actually written on it.

18 **A. Well I --**

19 **You'd have to refresh my memory going --**
20 **going back.**

21 Q. And we will later on, but --

22 **A. Okay.**

23 Q. -- you don't deny that you've written on it.

24 **A. Not at this point, no.**

25 Q. And you would agree with me that as an

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1 engineer, as a professor of engineering, that you
2 would expect to be provided by 3M in this case all the
3 testing that was done and -- all the testing that was
4 done by 3M or others so that at least you can compare
5 your results with what other people did; correct?

6 MR. GOSS: Object -- objection.

7 **A. I would expect that would be the case.**

8 Q. Assuming that all tests that were done with
9 the Bair Hugger, including particle tests, all showed
10 an increase in the particles when the Bair Hugger was
11 turned on, would that in any way affect your opinions?

12 MR. GOSS: Object to form.

13 **A. I'd have to look at those -- all those --**
14 **those reports and then evaluate them.**

15 Q. Excuse me?

16 **A. I would have to look at all the reports and**
17 **then evaluate them.**

18 Q. Okay. So it may affect your opinion.

19 **A. It's possible.**

20 Q. Okay. And if someone, such as someone at
21 the NIH, did a CFD analysis of the Bair Hugger and
22 showed that there was a disruption in the airflow when
23 the Bair Hugger was turned on, that may be relevant
24 information in formulating your opinions; correct?

25 MR. GOSS: Object to form.

23 (Pages 89 to 92)

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<p style="text-align: right;">Page 93</p> <p>1 A. Possibly. I'd have to look at the study and 2 make my own judgment. 3 Q. Okay. And, for example, if there was a 4 peer-reviewed article out there that indicate -- that 5 did temperature measurements around the operating room 6 table that showed a significant increase in -- a 7 statistically significant increase in the temperature 8 above the operating room table when the Bair Hugger 9 was on compared to when the Bair Hugger was off, that 10 may be relevant to you in formulating your opinions; 11 correct? 12 A. It's possible. 13 Q. Okay. But at least it would be a place for 14 you to compare your results to other peer-reviewed 15 literature in the field; correct? 16 A. Yes, I could do that. 17 Q. And by the way, your expert opinion is not 18 peer-reviewed; correct? 19 A. That's correct. 20 Q. Okay. It hasn't been tested or -- or 21 checked by any of the colleagues in your field; 22 correct? 23 A. It's -- it's my own personal opinion. 24 Q. Okay. Do you know -- do you know what peer 25 review is?</p>	<p style="text-align: right;">Page 95</p> <p>1 A. Well I can think of a car is a risk to 2 humans, too, if you get in an accident. 3 Q. Yeah. But there's, for example, the Pinto. 4 The Pinto was a dangerous device; correct? 5 A. Well it was a car that had a lot of 6 accidents associated with it. 7 Q. Yeah. And it caused severe injuries as a 8 result of a design error; correct? 9 A. Well I'm not sure if you'd say design error, 10 but based on the product. 11 Q. Well the product was designed; correct? 12 A. It was designed. 13 Q. Okay. And there was an error in the design 14 that could have been fixed that wasn't fixed; correct? 15 MR. GOSS: I'm just going to object to 16 foundation on this. 17 Q. You're aware of the Pinto case; correct? 18 A. Yes. 19 Q. Okay. And you actually -- 20 I mean in most engineering schools you're 21 taught about that case; correct? 22 A. I -- I'm not aware of that. I'm not in that 23 area. 24 Q. You're not in engineering ethics? 25 A. Well I'm in engin --</p>
<p style="text-align: right;">Page 94</p> <p>1 A. I do. 2 Q. What is peer review? 3 A. It's a review by colleagues who are familiar 4 with the -- in the engineering world, the technology 5 that you're working with. 6 Q. Okay. And it's like a checks and balances 7 to make sure there's no junk science published in the 8 literature; correct? 9 A. Assuming that -- the reviewers have 10 appropriate credentials and appropriate expertise to 11 evaluate your -- your publication or your -- your 12 report, then yes. That's not always the case. 13 Q. There is some junk science out there; 14 correct? 15 A. Yeah. 16 Q. And you will agree with me that there's 17 actually some dangerous products out there; correct? 18 A. I don't know how you would -- 19 That seems to be a very broad -- 20 Q. Well -- 21 A. -- categorization. 22 Q. There -- there are devices out there that 23 end up being a risk to -- to humans, correct, that are 24 manufactured? 25 MR. GOSS: Object to form.</p>	<p style="text-align: right;">Page 96</p> <p>1 I've never taught a class in engineering 2 ethics and I don't -- would not work with the Pinto, 3 for example, in any -- any of my examples. 4 Q. You've never taught -- taught a class on 5 engineering ethics? 6 A. I've never -- never taught a class on 7 engineering ethics, no. 8 Q. Have you ever taken a class in engineering 9 ethics? 10 A. I've taken some -- I wouldn't call it a -- a 11 class or a -- 12 Training I would say. 13 Q. Are there any other Kuehns that teach at the 14 University of Minnesota in the engineering department? 15 A. Not with the same spelling of my name that 16 I'm aware of. 17 Q. Okay. 18 A. I couldn't rule it out, but I don't know of 19 any personally. 20 Q. Do you agree that engineers should uphold 21 and advance the integrity, honor and dignity of the 22 engineering profession? 23 A. I will agree with that. 24 Q. Do you agree that engineers should be 25 objective?</p>

24 (Pages 93 to 96)

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1 **A. Yes.**
 2 Q. Do you agree that engineers should have --
 3 should be honest?
 4 **A. Yes.**
 5 Q. Do you believe that engineers should have
 6 integrity?
 7 **A. Yes.**
 8 Q. Do you believe that they need all those
 9 things in formulating their opinions?
 10 **A. Yes, that would be --**
 11 Q. Honesty, integrity and objectivity.
 12 **A. I -- I would agree with that.**
 13 Q. Okay. Do you believe that engineers of 3M
 14 should be held to the same standard?
 15 **A. Well I think all engineers should be held to**
 16 **the same standard.**
 17 Q. Okay. Do you agree that engineers must use
 18 their knowledge and skill for enhancement of human
 19 welfare?
 20 **A. I -- I would agree with that.**
 21 Q. Do you agree that human safety should always
 22 come first?
 23 **A. I'm not sure I would agree with that.**
 24 Q. You don't believe safety should come first?
 25 **A. If -- if a product doesn't do what it's**

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1 Q. Okay. You guys actually have a class on
 2 that; correct?
 3 **A. Yes.**
 4 Q. And you teach your students that engineers
 5 need to be honest.
 6 **A. Yes.**
 7 Q. To be impartial.
 8 **A. Yes.**
 9 Q. To serve with fidelity to the public.
 10 **A. Sounds like you're reading from something,**
 11 **but --**
 12 **It sounds like a -- like in the ASME Code of**
 13 **Ethics or something. So --**
 14 Q. And that's a code of ethics by the American
 15 Society of Mechanical Engineers; correct?
 16 **A. That's where I thought it was coming from,**
 17 **yes.**
 18 Q. And it should be applied to all engineers;
 19 correct?
 20 **A. Yes.**
 21 Q. Even 3M engineers; correct?
 22 **A. As I said before, all engineers.**
 23 Q. So you agree that 3M -- 3M's engineers
 24 should be honest, impartial, and serve with fidelity.
 25 **A. Yes.**

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1 **supposed to, then -- then the safety is -- is**
 2 **immaterial.**
 3 Q. Okay. Do you believe, with respect to
 4 designing a medical device that goes in an operating
 5 room, that the medical device should not increase the
 6 risk of harm to a patient?
 7 MR. GOSS: Object to form, --
 8 **A. I --**
 9 MR. GOSS: -- foundation.
 10 **A. I -- I would agree.**
 11 Q. I mean I'm not sure you're aware of this,
 12 but I'm an engineer as well, mechanical engineer,
 13 graduate from the University of Florida, and I was
 14 always taught that engineering is a profession, not
 15 just a job. You have a duty to the public. Do you
 16 agree with that?
 17 **A. I -- I agree with that.**
 18 Q. So engineering is -- is -- is a profession.
 19 **A. Yes.**
 20 Q. You have a duty to the public; correct?
 21 **A. Yes.**
 22 Q. And as a professor of engineering, you have
 23 a duty to teach ethical behavior to your students;
 24 correct?
 25 **A. It's included in our curriculum, yes.**

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1 Q. Okay. And as an expert in this case and as
 2 a member of ASME, you must follow engineering ethics;
 3 correct?
 4 **A. Yes.**
 5 Q. And to do that and to do that in formulating
 6 your opinion, you should have all the information --
 7 reasonable information available to you in formulating
 8 your opinion; correct?
 9 **A. I think all reasonable information, yes.**
 10 Q. Okay. You should have all the relevant
 11 studies that were done to review before formulating
 12 your opinions; correct?
 13 **A. All that I think are relevant, yes.**
 14 Q. Okay. And you should have the opinions --
 15 all the relevant studies, whether or not they're
 16 supportive or critical of the Bair Hugger in this
 17 case, correct, before formulating your opinion;
 18 correct?
 19 **A. That would be ideal.**
 20 Q. Well as an engineer, before you solve a
 21 problem, you have to research the problem; correct?
 22 **A. Yes.**
 23 Q. Okay. That -- that goes to the integrity of
 24 your opinions; correct?
 25 **A. Yes.**

25 (Pages 97 to 100)

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<p style="text-align: right;">Page 101</p> <p>1 Q. Okay. And you would expect that 3M would 2 provide you with all the information they had 3 available to educate you on the issues in this case; 4 correct?</p> <p>5 A. That would be my assumption.</p> <p>6 Q. Because at the end of the day when it comes 7 to engineering and formulating your opinion, integrity 8 and honesty are the most important things; correct?</p> <p>9 A. I think personally, yes.</p> <p>10 Q. Well as an engineer dealing with people's 11 lives and -- and coming to conclusions, you have to be 12 objective, honest, and have integrity.</p> <p>13 MR. GOSS: Object to form, asked and 14 answered.</p> <p>15 A. Yeah, I -- as I say, I think I've answered 16 that already.</p> <p>17 Q. And these principles we're talking about, 18 engineering ethics, that's a required class for all 19 mechanical engineering students at the University of 20 Minnesota; correct?</p> <p>21 A. It is.</p> <p>22 Q. And I believe it's a required class for all 23 mechanical engineering students at any accredited 24 university; correct?</p> <p>25 A. I believe it's an ABET requirement.</p>	<p style="text-align: right;">Page 103</p> <p>1 cheaper to pay off people in lawsuits than fix the 2 problem; correct?</p> <p>3 A. I do not recall that level of detail on that 4 particular case.</p> <p>5 Q. We'll get to that in a second then.</p> <p>6 Are you aware of the Citibank case, Citibank 7 Building?</p> <p>8 A. You'll have to educate me or remind me.</p> <p>9 Q. The Citibank Building in New York City where 10 it was built and some graduate student came in later 11 on and realized that if the wind hit it at a certain 12 angle, the -- the skyscraper would fail. Does that 13 refresh your recollection?</p> <p>14 A. I don't recall that, no.</p> <p>15 Q. Okay. Now you agree with me that there's a 16 certain process that -- that engineers are taught when 17 there is a problem in a design.</p> <p>18 A. I'm -- I'm not sure that's actually part of 19 the education.</p> <p>20 Q. Okay. Well you agree with me when there is 21 a problem in a design, the first thing to look at is 22 to determine who are the stakeholders. Does that 23 sound familiar?</p> <p>24 A. Well if there's a problem in the -- in the 25 design, it's usually the design does not meet the</p>
<p style="text-align: right;">Page 102</p> <p>1 Q. Okay. And in fact you can't become a member 2 of the American Society of Mechanical Engineers unless 3 you've taken engineering ethics; correct?</p> <p>4 A. I -- I -- I don't know about that level of 5 detail.</p> <p>6 Q. Okay. You agree with me that engineers 7 should solve a potential problem instead of ignoring 8 it; correct?</p> <p>9 A. Yes.</p> <p>10 Q. I mean engineers are problem-solvers; right?</p> <p>11 A. Yes.</p> <p>12 Q. They're not problem-hiders. They don't hide 13 problems, they should solve problems; correct?</p>	<p style="text-align: right;">Page 104</p> <p>1 expect -- expected requirements or expected outcome.</p> <p>2 Q. What do you teach engineers when -- of what 3 to do when a potential problem is identified?</p> <p>4 A. I'm not sure I actually teach that in any of 5 my courses.</p> <p>6 Q. Were you ever taught what to do if and when 7 a problem is identified in the design that's out in 8 the -- in the market?</p> <p>9 A. I do not recall that, no.</p> <p>10 Q. Would you agree with me that an engineer who 11 has a potential problem identified to them should 12 identify a potential solution before they consider the 13 impact on potential stakeholders?</p>
<p>14 MR. GOSS: Object to form.</p> <p>15 A. Well that's what -- what engineers are 16 trained to do.</p> <p>17 Q. Okay. And if an engineer is aware of a 18 problem, it would be unethical to try to hide it 19 publicly; correct?</p> <p>20 MR. GOSS: Object to form.</p> <p>21 A. Possibly.</p> <p>22 Q. That was a big issue with the Pinto, is that 23 the engineers, they looked at it and they tried to 24 hide it publicly instead of solving the problem 25 because the bean counters came up and said it would be</p>	<p>14 MR. GOSS: Object to form.</p> <p>15 A. I -- I think an engineer would look at the 16 entire scenario and -- and determine what -- what a 17 possible path forward would be.</p> <p>18 Q. So they would look at the cost of the 19 path -- the cost of the time when they're trying to 20 solve the problem?</p> <p>21 A. That would be part of it.</p> <p>22 Q. You think they should look at -- if 23 there's --</p> <p>24 If there's a product out there that has 25 potential to injure people, that in finding a</p>

26 (Pages 101 to 104)

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1 solution, they should look at the cost of the
 2 solution; is that your testimony today?
 3 MR. GOSS: Objection, incomplete
 4 hypothetical.
 5 **A. Again, an en --**
 6 **Any engineering decisions, that's -- that's**
 7 **always part of the final solution.**
 8 Q. I'm not talking about the final solution,
 9 I'm talking about finding the initial solution.
 10 Should they look at the cost?
 11 MR. GOSS: Same objection.
 12 **A. It -- it's part of the path to the approach**
 13 **of the final solution. It's one of the considerations**
 14 **along the way.**
 15 Q. Is that what you teach your students?
 16 MR. GOSS: Objection, form, asked and
 17 answered.
 18 Q. So sitting here today, you don't believe
 19 you've ever taught a case -- a class in ethics.
 20 **A. As I said before, I've not taught -- taught**
 21 **a class in ethics, no.**
 22 Q. Did you ever lecture on ethics?
 23 **A. I think as part of a training program for**
 24 **graduate students, yes.**
 25 Q. Can you elaborate on that a little bit more.

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1 **A. Our -- our department has a separate you**
 2 **might call it short course for -- for providing ethics**
 3 **training for graduate students, and at one time I was**
 4 **involved in -- in that course. And it was, again,**
 5 **many years ago, so I don't remember the -- the details**
 6 **of my -- my involvement.**
 7 Q. How long ago?
 8 **A. Probably 15 years ago.**
 9 Q. Okay. Would that be a 5000- or 6000-level
 10 class?
 11 **A. No, it's a separate --**
 12 **It -- it's not listed in the class schedule.**
 13 **It's a separate simply ethics required course that all**
 14 **graduate students must attend. Or I shouldn't say**
 15 **course, a training.**
 16 MR. ASSAAD: Let's take a five-minute break.
 17 THE REPORTER: Off the record, please.
 18 (Recess taken.)
 19 (Kuehn Exhibit 6 was marked for
 20 identification.)
 21 BY MR. ASSAAD:
 22 Q. So marked as Exhibit 6 is a PowerPoint
 23 presentation obtained from the University of Minnesota
 24 in the fall of 2010 titled "ME 4054: Ethics in
 25 Design." Do you see that?

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1 **A. I see that.**
 2 Q. And it says "Prof. Kuehn" at the bottom.
 3 **A. And also was 17 years ago, which is close to**
 4 **my estimate of 15 years ago.**
 5 Q. It says fall of 2010.
 6 **A. Seven years ago. Okay.**
 7 Q. Okay.
 8 **A. My mistake.**
 9 Q. Okay. Does this refresh your recollection
 10 of teaching a course on ethics in design?
 11 **A. This course ME 4054 is a -- is our senior**
 12 **design course, and I apparently taught that course, it**
 13 **must have been in fall of 2010, and --**
 14 Q. And --
 15 **A. -- this was the -- looks like the set of**
 16 **notes I gave for that particular lecture.**
 17 Q. And it was on ethics; correct?
 18 **A. Yes.**
 19 Q. Okay. I'd like you to turn to page six. Do
 20 you recall teaching your students about case study
 21 number one, the Ford Pinto in the 1970s?
 22 **A. Apparently I must have.**
 23 Q. Okay. And you had some group discussion
 24 items with respect to the case study of the Ford
 25 Pinto, which is the slide on the bottom of the page;

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1 correct?
 2 **A. Yes.**
 3 Q. It says, "Ford knows there's a problem.
 4 What should they do?
 5 "Group Discussion Items."
 6 Do you see that?
 7 **A. I -- I don't -- do not see that.**
 8 Q. "Ford knows there's a problem."
 9 **A. Oh.**
 10 Q. "What should they do?"
 11 **A. Yes, okay.**
 12 Q. "Group Discussion Items."
 13 **A. Okay.**
 14 Q. And -- and this is what you're teaching your
 15 students; correct?
 16 **A. This was a set of notes that was generic to**
 17 **the course that -- that I used when I was facilitating**
 18 **the -- the course at that time.**
 19 Q. And you were with a bunch of other
 20 professors in that course; correct?
 21 **A. Yes.**
 22 Q. Okay. But you yourself taught this lecture
 23 to your students; correct?
 24 **A. Apparently I did, yes.**
 25 Q. Okay.

27 (Pages 105 to 108)

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<p style="text-align: right;">Page 109</p> <p>1 MR. GOSS: I'm just going to state an 2 objection that he's not being offered to provide any 3 opinions on engineering ethics. That's my objection. 4 MR. ASSAAD: Okay. 5 Q. The first one are -- 6 The first question is "Who are the 7 stakeholders?" What did you mean by that? 8 A. I guess going back and thinking about this 9 again, I mean I haven't looked at this for a long 10 time, it probably would include the -- the company, 11 the people who bought the product, and maybe other 12 service personnel. 13 Q. So basically the manufacturer and the 14 consumers; correct? 15 A. Well those would be the two main 16 stakeholders. 17 Q. So with respect to the Ford Pinto, the 18 stakeholders would be the -- the manufacturer, Ford; 19 correct? 20 A. Yes. 21 Q. The consumers that bought the Ford Pinto; 22 correct? 23 A. Yes. 24 Q. As well as, if there's a car accident, other 25 individuals that might be involved in the accident;</p>	<p style="text-align: right;">Page 111</p> <p>1 Q. They ignored the problem. 2 A. I can't speak for Ford, but -- 3 Q. Okay. Under "Group Discussion Items," 4 number two, you teach your students "Propose as many 5 different alternative solutions as you can think of;" 6 correct? 7 A. That's what it says. 8 Q. And you agree with that; correct? 9 A. Yes. 10 Q. Okay. It says, "Do not assign any value or 11 determine the implications of this proposed solution 12 for now;" correct? 13 A. That's the brainstorming part, yes. 14 Q. So you find a solution and you don't take 15 into account, at this time of -- of -- of the problem 16 solving, the implications of cost. 17 A. I believe that to be correct. 18 Q. Okay. And that's ethical; correct? 19 A. This is the first stage, the brainstorming- 20 potential-problem part of the solution, yes. 21 Q. Okay. So the first stage is propose 22 solutions, you know, and not to consider cost. Agree? 23 A. I would agree with that. 24 Q. Okay. And this is an outline that you 25 created; correct?</p>
<p style="text-align: right;">Page 110</p> <p>1 correct? 2 A. That's -- that's potentially correct, yes. 3 Q. Okay. But just to refresh your 4 recollection, you remember the Pinto had a problem 5 with the -- with the gas tank; correct? 6 A. Yes. 7 Q. Okay. And in certain rear-end collisions it 8 could cause it to catch on fire and explode. 9 A. That -- that's what I recall. 10 Q. Okay. And Ford knew about this problem but 11 decided not to do anything about it; correct? 12 A. That's what I had read. 13 Q. Okay. And in fact, based on this case</p>	<p style="text-align: right;">Page 112</p> <p>1 A. I did not, actually. This was an outline 2 provided to me by the overall course instructor for 3 the design course that I then used in this particular 4 lecture. 5 Q. But you don't disagree with this outline; 6 correct? 7 A. I do not disagree with it, no. 8 Q. And this is also taught by the American 9 Society of Mechanical Engineers; correct? 10 A. Yes. 11 Q. Okay. Once you come up with a solution, you 12 go to number three and it states, "Now try to predict 13 each option's impact on the stakeholders;" correct?</p>
<p>14 study, I'm sure that you taught your students what 15 Ford did was unethical; correct? 16 A. Yes. 17 Q. Okay. Because they put profits over safety; 18 correct? 19 A. Again -- 20 MR. GOSS: Object to form. 21 A. Well, their approach to the problem was 22 perhaps not as expedient as -- as might be 23 anticipated -- 24 Q. They ignored the problem. 25 A. -- or expected.</p>	<p>14 A. That's what it says. 15 Q. So, for example, in the Ford Pinto case you 16 look at what the cost would be to Ford as well as the 17 effect they put on the safety of the consumer as well 18 as other people that are on the road; correct? 19 A. I would think you would include all 20 stakeholders involved, yes. 21 Q. Okay. Number four is "Determine the best 22 possible course of action and explain the reasons for 23 your choice;" correct? 24 A. That's what it says. 25 Q. Okay. And that would be a -- similar to a</p>

28 (Pages 109 to 112)

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1 cost/benefit analysis; correct?

2 **A. That would probably include cost, but this**

3 **is more than that.**

4 Q. Well what else would it include?

5 **A. Potential time to make potential**

6 **modifications, could it be done quickly or if it would**

7 **take mult -- multiple years, for example.**

8 Q. Are you familiar with the Takata litigation?

9 **A. Say that again.**

10 Q. The Takata -- Takata/Takata litigation

11 regarding airbags?

12 **A. I have heard of that. I'm not very familiar**

13 **with that.**

14 Q. Okay. Do you know whether or not you have a

15 Takata airbag in your car?

16 **A. I do not know.**

17 MR. GOSS: I got a notice last week.

18 MR. ASSAAD: Off the record.

19 THE REPORTER: Off the record, please.

20 (Discussion off the record.)

21 BY MR. ASSAAD:

22 Q. Number five states, "Are your answers to the

23 above questions the same regardless of whom you

24 represent? In other words, does one's response change

25 depending on one's stake in the solution?" Did I read

Page 115

1 In this case the solution should be a car

2 that's driven that doesn't blow up; correct?

3 **A. I guess one could come to that conclusion,**

4 **yes.**

5 Q. Well what's your conclusion?

6 **A. Well that -- that would -- I would --**

7 **I would agree with that.**

8 Q. Because as an engineer you have a

9 fidelity, you have a fidelity to the public; correct?

10 **A. Yes.**

11 Q. Go to page eight. Do you agree with respect

12 to the Ford Pinto that Ford decided not to change the

13 design?

14 **A. That -- that didn't seem to be a wise**

15 **decision.**

16 Q. And you write down, "An internal Ford memo

17 stated that it would be cheaper to pay off possible

18 lawsuits for resulting deaths than recall the

19 vehicles. A cost-benefit analysis compared the cost

20 of a \$13 repair against the monetary value of a human

21 life." Did I read that correctly?

22 **A. I --**

23 **You read that correctly.**

24 Q. And you agree with me that the engineers and

25 the people at Ford that decided to go along that

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1 that correctly?

2 **A. I believe you read it correctly.**

3 Q. When you taught that to your students, what

4 did you mean by that?

5 **A. In what it says here, and I guess I would**

6 **agree with that, is whether you represent the -- let's**

7 **take two stakeholders, the manufacturer or the owners**

8 **of vehicles, that the solution should be acceptable to**

9 **both sides.**

10 Q. Okay. So basically, if you're a consumer

11 that owns a Pinto, the solution should be I should

12 have a car that doesn't blow up and catch on fire.

13 **A. Well the solution hopefully would be**

14 **whatever -- whatever would mitigate the problem in the**

15 **first place.**

16 Q. Okay. So you're --

17 If you're the consumer, you want to drive a

18 car that's safe; correct?

19 **A. You want to make sure the problem that was**

20 **identified had been corrected.**

21 Q. And by "corrected," you mean driving a safe

22 car that the gas tank doesn't blow up.

23 **A. I guess I would agree with that.**

24 Q. Okay. And that's what you taught your

25 students as well. You should have a car --

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1 course of action, you consider that to be unethical.

2 **A. I do.**

3 Q. Go to page 14. You're familiar with the

4 Challenger explosion; correct?

5 **A. Yes.**

6 Q. And it was a faulty O-ring, do you recall

7 that?

8 **A. I recall that.**

9 Q. Okay. And in fact the potential for failure

10 was identified in the failure mode and effects

11 analysis process, but NASA management pushed for

12 launch. Do you recall -- recall --

13 Do you see that at the bottom?

14 **A. I see that at the bottom, yes.**

15 Q. And you recall that; correct?

16 **A. I don't recall that detail at the time.**

17 **Again, someone else put these notes together, so I --**

18 **I would agree that's correct.**

19 Q. But you were aware of the Challenger, and

20 later on they found out that they pushed for launch

21 even though they were aware of the possible failure of

22 the O-ring; correct?

23 **A. I do recall that.**

24 Q. And so they ignored -- they ignored the --

25 the -- the potential failure and decided to go for the

29 (Pages 113 to 116)

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<p style="text-align: right;">Page 117</p> <p>1 launch, and that was a big criticism, and determined</p> <p>2 that that behavior was unethical according to</p> <p>3 engineering standards; correct?</p> <p>4 MR. GOSS: Objection, form, foundation.</p> <p>5 A. I -- I don't -- I don't recall the</p> <p>6 engineering-ethics part, but I do recall the -- the --</p> <p>7 the issue.</p> <p>8 Q. If you go to page 18 -- or 16, you teach</p> <p>9 your students, "Compromise is not an option." Do you</p> <p>10 agree with that?</p> <p>11 A. That's what it says, and --</p> <p>12 Q. That's what you taught your students.</p> <p>13 A. Yes.</p> <p>14 Q. Okay.</p> <p>15 A. Uh-huh.</p> <p>16 Q. It states, "Most engineers never encounter</p> <p>17 an ethical dilemma during your career. If you do,</p> <p>18 think it through and take advice as appropriate." Do</p> <p>19 you agree with that?</p> <p>20 A. Yes, I do.</p> <p>21 Q. And then you teach your students, "Nine of</p> <p>22 the most dangerous words in the English language are:</p> <p>23 'If I ignore it, maybe it will go away.'" Do you</p> <p>24 agree those are dangerous words as an engineer?</p> <p>25 A. Yes.</p>	<p style="text-align: right;">Page 119</p> <p>1 Q. Okay. You agree that engineers and</p> <p>2 corporations they work for should not suppress</p> <p>3 research.</p> <p>4 A. I think --</p> <p>5 Well by suppressing research, do you mean</p> <p>6 suppressing release of information?</p> <p>7 Q. No. Let's put it this way: If a</p> <p>8 corporation has a product in the market and the</p> <p>9 organization or researchers want to do research on the</p> <p>10 safety of that product, you agree with me that the</p> <p>11 corporation should not suppress the research on that</p> <p>12 product dealing with the safety of the product.</p> <p>13 MR. GOSS: Objection, incomplete</p> <p>14 hypothetical.</p> <p>15 A. Well I -- I would hope that would be the</p> <p>16 case.</p> <p>17 Q. So you agree with that statement.</p> <p>18 A. Yes.</p> <p>19 Q. Okay. You would expect a reasonable,</p> <p>20 prudent company to identify solutions to potential</p> <p>21 problems with their products; correct?</p> <p>22 MR. GOSS: Objection, form.</p> <p>23 A. I would -- I would expect that.</p> <p>24 MR. ASSAAD: Basis.</p> <p>25 MR. GOSS: Vague.</p>
<p style="text-align: right;">Page 118</p> <p>1 Q. And that's not something you would teach</p> <p>2 your students to do, to ignore potential problems.</p> <p>3 A. Not -- not if you're certainly made aware of</p> <p>4 it, no.</p> <p>5 Q. Okay. And then you write down, "Most large</p> <p>6 companies and organizations have an ethics or</p> <p>7 ombudsman office that allows employees to report or</p> <p>8 discuss ethics concerns confidentially." Do you know</p> <p>9 whether or not 3M has such an office?</p> <p>10 A. I have no idea.</p> <p>11 Q. You agree that lack of due diligence could</p> <p>12 create an ethical dilemma; correct?</p> <p>13 MR. GOSS: Objection, vague.</p>	<p style="text-align: right;">Page 120</p> <p>1 Q. Did you understand my question?</p> <p>2 A. Could you repeat it?</p> <p>3 Q. You would expect a reasonable, prudent</p> <p>4 corporation to identify solutions to potential</p> <p>5 problems with their products; correct?</p> <p>6 A. Yes.</p> <p>7 Q. You understood the question; correct?</p> <p>8 A. Yes.</p> <p>9 Q. And you agree with that statement; correct?</p> <p>10 A. Yes.</p> <p>11 Q. And then we just discussed before, in</p> <p>12 identifying solutions in the initial brainstorming you</p> <p>13 should not consider cost.</p>
<p>14 A. Say that again.</p> <p>15 Q. Lack of due diligence by ignoring something</p> <p>16 could cause an ethical dilemma.</p> <p>17 A. Potentially, yes.</p> <p>18 Q. Okay. You agree that engineers and the</p> <p>19 corporations they work for should not manipulate</p> <p>20 research.</p> <p>21 A. I -- I should think they would -- should not</p> <p>22 manipulate research results or research data.</p> <p>23 Q. Yeah. They should not manipulate the</p> <p>24 results of the data; correct?</p> <p>25 A. Correct.</p>	<p>14 A. That's what I said, and I still agree with</p> <p>15 that.</p> <p>16 Q. Okay. Engineers and corporations should not</p> <p>17 ignore research conducted by other scientists with</p> <p>18 respect to the safety of the company's product. Do</p> <p>19 you agree with that?</p> <p>20 MR. GOSS: Object to form, incomplete</p> <p>21 hypothetical.</p> <p>22 A. I would think that would be prudent.</p> <p>23 Q. So you agree with that statement.</p> <p>24 A. Yes.</p> <p>25 Q. An engineer should not ignore apparent</p>

30 (Pages 117 to 120)

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1 problems; correct?
 2 MR. GOSS: Objection, vague.
 3 **A. Could you define "apparent?"**
 4 Q. Well if there's a problem they're aware of,
 5 an apparent problem, they know of a problem or a
 6 potential problem, they should not ignore it.
 7 **A. Potential problems are difficult to**
 8 **anticipate, so I would -- I would think they should be**
 9 **aware of actual problems that are brought to their**
 10 **attention.**
 11 Q. So apparent. They should be --
 12 They should not ignore an apparent problem.
 13 **A. If they're aware of a real problem that**
 14 **exists.**
 15 Q. Okay. Do you agree with me that engineers
 16 and corporations should not ignore apparent problems
 17 by dismissing or criticizing safety issues raised by
 18 peer-reviewed studies?
 19 MR. GOSS: Object to form, incomplete
 20 hypothetical.
 21 **A. Can you repeat that, please?**
 22 Q. Engineers should not ignore apparent
 23 problems by dismissing or criticizing safety issues
 24 raised by peer-reviewed studies.
 25 MR. GOSS: Same objection.

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1 You can answer if you can.
 2 **A. Repeat that, please.**
 3 Q. Engineers should take into account warnings
 4 of other similar devices in the field.
 5 MR. GOSS: Same objection.
 6 **A. If they're --**
 7 **It depends how -- how close the other**
 8 **devices are to their device, and again, being aware of**
 9 **any issues that have resulted -- that have developed.**
 10 Q. Well if you have a forced-air warming device
 11 made by 3M and a similar device made by another
 12 company that warns of a certain risk, the 3M engineers
 13 should be aware of the other device's warnings and
 14 determine whether or not they're typical to the device
 15 that they're manufacturing; correct?
 16 MR. GOSS: Same objection, beyond the scope
 17 of what he's being offered to testify to.
 18 **A. I think a prudent engineer should be aware**
 19 **of that, and whether that makes --**
 20 **The decision has to be made by somebody**
 21 **whether it's really going to affect their product or**
 22 **not.**
 23 Q. Were you provided any warnings in your
 24 review or in the formulation of your opinions with
 25 respect to other patient warming devices that are used

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1 Q. Do you understand that question?
 2 **A. I -- I think I do.**
 3 **I think like an engineer should take those**
 4 **into consideration when making any -- any judgments.**
 5 Q. Well, for example, if a study comes out and
 6 states that a company's product is defective or
 7 unsafe, a company should not ignore that study.
 8 MR. GOSS: Objection, incomplete
 9 hypothetical.
 10 **A. Again, if they're made aware of it, I -- I**
 11 **would agree with that.**
 12 Q. Now when designing a device, engineers
 13 should take into account warnings of other similar
 14 devices that are in the market; correct?
 15 MR. GOSS: Same objection.
 16 **A. I think one -- I think one -- one should be**
 17 **aware of potential similar products --**
 18 Q. Okay.
 19 **A. -- and -- and issues associated with them.**
 20 Q. And the warnings of those products given by
 21 out -- by those products; correct?
 22 **A. Again, the --**
 23 MR. GOSS: Objection to form and lack of
 24 foundation. I'd also object that he's not being
 25 offered to provide opinions on warnings.

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1 in the -- that are sold in the -- in the market?
 2 **A. I may have. I can't recall.**
 3 Q. Okay. But if you had been provided, that
 4 would be on the list of Exhibit E of Exhibit 1 of this
 5 deposition; correct?
 6 **A. It may have just been discussions with**
 7 **counsel.**
 8 Q. Okay. Well do you recall any type of
 9 warnings provided by other manufacturers, sitting here
 10 today?
 11 **A. Not off the top of my head, no.**
 12 Q. You agree with me that when engineers
 13 determine the safety of a device, they should not
 14 consider potential litigation.
 15 **A. I -- I think an engineer should -- should do**
 16 **that, yes.**
 17 Q. Should not consider potential litigation
 18 when determining the safety of a device; correct?
 19 **A. I think they should make the device as safe**
 20 **as -- as is feasible from an engineering standpoint.**
 21 Q. Litigation should have nothing to do with
 22 that situation; correct?
 23 **A. I would think not.**
 24 Q. Okay. Now my understanding is you've only
 25 reviewed three articles with respect to the Bair

31 (Pages 121 to 124)

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<p style="text-align: right;">Page 125</p> <p>1 Hugger -- with respect to the Bair Hugger; correct?</p> <p>2 A. I -- I believe that's correct.</p> <p>3 Q. Okay. And that is going to be the three --</p> <p>4 the last three items on Exhibit E, correct, of</p> <p>5 Exhibit 1?</p> <p>6 A. Let me look at Exhibit 1 here.</p> <p>7 I believe that's correct.</p> <p>8 Q. You have not reviewed any of the Andrew Legg</p> <p>9 studies; correct?</p> <p>10 A. I have not.</p> <p>11 Q. And are you aware that Andrew Legg did the</p> <p>12 particle testing and -- and -- on the Bair Hugger?</p> <p>13 A. I was not aware of that, no.</p> <p>14 Q. Okay. You have not reviewed the published</p> <p>15 literature by Dr. McGovern and Dr. Reed; have you?</p> <p>16 A. The Reed article at the very end I have.</p> <p>17 Q. Okay. But that dealt with the -- with the</p> <p>18 evaluation of the intake filtration; correct?</p> <p>19 A. Yes.</p> <p>20 Q. Okay. But you haven't read the McGovern</p> <p>21 article dealing with neutral buoyancy bubbles as well</p> <p>22 as infection rates; have you?</p> <p>23 A. I -- I do not believe so, no.</p> <p>24 Q. Okay. You have not read an article by</p> <p>25 Dasari with respect to temperature measurements around</p>	<p style="text-align: right;">Page 127</p> <p>1 Q. By the way, these were all peer-reviewed</p> <p>2 literature. You're aware of that; correct?</p> <p>3 A. If you say that. I'm not aware of the</p> <p>4 citations.</p> <p>5 Q. Have -- have you reviewed the letter by</p> <p>6 Farhad Memarzadeh --</p> <p>7 MS. ZIMMERMAN: Memarzadeh.</p> <p>8 MR. GOSS: Memarzadeh.</p> <p>9 Q. -- Memarzadeh that was a letter to the</p> <p>10 editor of the Moretti article talking about his CFD</p> <p>11 analysis?</p> <p>12 A. No, I have not.</p> <p>13 Q. Have you --</p> <p>14 Were you provided with an e -- an internal</p> <p>15 e-mail by 3M talking about whether or not air goes</p> <p>16 through -- gets into the system or bypasses the filter</p> <p>17 when it gets into the -- to the Bair Hugger system?</p> <p>18 Are you aware of that e-mail?</p> <p>19 A. I do not recall that, no.</p> <p>20 Q. Okay. Were you provided schematics of -- of</p> <p>21 the Bair Hugger and the tolerances of where the filter</p> <p>22 fits in, where the seat of the filter is?</p> <p>23 A. I do not recall seeing tolerances of the</p> <p>24 filter, filter fit or -- no.</p> <p>25 Q. So when you're determining whether or not</p>
<p style="text-align: right;">Page 126</p> <p>1 the operating room or above the surgical table when</p> <p>2 the Bair Hugger was turned on as compared to when it</p> <p>3 was turned off; correct?</p> <p>4 A. I have not.</p> <p>5 Q. You have not looked at the Sessler article</p> <p>6 regarding particle tested -- particle testing in a</p> <p>7 unidirectional operating room in Holland that was</p> <p>8 actually done, conducted by 3M.</p> <p>9 MR. GOSS: Object to form.</p> <p>10 A. I don't -- don't recall that, no.</p> <p>11 Q. You haven't read the Brandt article;</p> <p>12 correct?</p> <p>13 A. No.</p>	<p style="text-align: right;">Page 128</p> <p>1 the filter is appropriate for the Bair Hugger in your</p> <p>2 opinions, you're not taking into account whether or</p> <p>3 not the filter is seated well into the Bair Hugger;</p> <p>4 correct?</p> <p>5 A. I've actually looked at -- at both models of</p> <p>6 Bair Hugger, the earlier one and the later one, and</p> <p>7 I've taken the filters out and put them back in, so I</p> <p>8 know what the seals are like, and in my best</p> <p>9 professional opinion they are well sealed.</p> <p>10 Q. So you -- so you believe -- it's your</p> <p>11 opinion that the 505 --</p> <p>12 You looked at the 505 and the 750?</p> <p>13 A. I believe it was the 775.</p>
<p>14 Q. You haven't read -- have you -- were you</p> <p>15 provided --</p> <p>16 Have you read the Huang article on bacteria</p> <p>17 testing in an operating room when the Bair Hugger is</p> <p>18 on as compared to when the Bair Hugger is off?</p> <p>19 A. No, I have not.</p> <p>20 Q. Have you read the Moretti article, which is</p> <p>21 a similar article doing bacterial testing -- or</p> <p>22 biological testing in an operating room when the Bair</p> <p>23 Hugger is on as compared to when the Bair Hugger is</p> <p>24 off?</p> <p>25 A. No, I have not.</p>	<p>14 Q. 775, which has similar indications with the</p> <p>15 750.</p> <p>16 A. Yes.</p> <p>17 Q. So you looked at the 505 filter?</p> <p>18 A. Yes.</p> <p>19 Q. And it's your opinion that the -- the --</p> <p>20 all the air that goes -- that comes out of the Bair</p> <p>21 Hugger is filtered through the filter?</p> <p>22 A. In the 505 there's some other holes near the</p> <p>23 top of the case which may communicate between the</p> <p>24 out -- outside air and in -- inside of the case. I'm</p> <p>25 not prepared to -- to state definitively everything</p>

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1 goes through the filter.

2 Q. Well if -- if air that is blown through the
3 Bair Hugger device is not 100 percent filtered through
4 the filter, would you agree with me that that's a
5 design defect?

6 A. Not necessarily.

7 Q. Why not?

8 A. Because filters are lost in other parts of
9 the system even if they do pass the filter.

10 Q. You said filter is lost in other --

11 A. Par -- particles are lost in other parts of
12 the airflow path before they leave the system through
13 the holes in the blankets.

14 Q. When you say they're lost to the air --
15 airflow path, what do you mean by that?

16 A. They're deposited on various surfaces as
17 they're carried along by the airflow if they were to
18 pass the filter.

19 Q. Can you -- did you test --

20 Did you take apart the Bair Hugger, or just
21 took off the filter?

22 A. I took off the filter.

23 Q. Okay. And that's both the 750 and the 775?

24 A. That's correct.

25 Q. Okay. And did you test to see whether or

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1 whether or not the values that you've obtained were
2 statistically significant; correct?

3 A. I did not do a statistical analysis, that --
4 that's correct.

5 Q. So would you agree with me that a -- a peer-
6 reviewed article that actually did calculations to see
7 whether the results are statistically significant have
8 more weight than your expert report on the same
9 issues?

10 A. It really depends on the expertise of the
11 researchers and the reviewers as to whether the
12 methodology was correct, the results are -- are
13 correct.

14 Q. But you don't know one way or the other
15 sitting here today; correct?

16 A. Without -- without looking at the -- at
17 actual reports and reviewing them myself, no.

18 Q. And you were not provided any of those
19 reports or literature by 3M; correct?

20 A. Other than what's listed in my list, no.

21 Q. Were you aware that in the older models of
22 Bair Hugger, that they actually warned for airborne
23 contamination when using the Bair Hugger?

24 A. I was not aware of that.

25 Q. Would that affect your opinions in this

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1 not there was any leakage in the 775?

2 A. I did no tests for leakage, no.

3 Q. Okay. Have you looked at other patient
4 warming devices?

5 A. I have not.

6 Q. Have you -- have you looked at the older
7 models of the Bair Hugger, the 200 series?

8 A. No, I have not.

9 Q. Have you looked at the Mistral that uses a
10 HEPA filter?

11 A. I have not.

12 Q. Are you aware that other patient warming
13 devices use a HEPA filter?

14 A. I have heard that that -- that unit does.

15 Q. So you're aware that the Mistral uses a HEPA
16 filter.

17 A. I -- I've -- I've been told by counsel.

18 Q. Okay. Are you aware that the Warmtouch --
19 Are you aware of the Warmtouch device?

20 A. I am not.

21 Q. Are you aware that that device uses a HEPA
22 filter?

23 A. I'm not aware of that.

24 Q. In your results, would you agree with me
25 that you did not perform a -- an analysis to determine

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1 case?

2 A. I do not think so.

3 Q. Did you re -- did you review the 510(k)
4 application for the 505 that was submitted to the FDA?

5 A. I have not seen that, no.

6 Q. Would it surprise you that in the 510(k)
7 application they actually warned, as one of the
8 warnings of the device, that there was a risk of
9 airborne contamination?

10 A. I -- I have -- I have no opinion on that. I
11 have not read the document.

12 Q. I understand that. But would you be --
13 Would that affect your opinions in any way?

14 A. No.

15 Q. Okay. So the mere fact that 3M admits that
16 when the Bair Hugger is on, every single study
17 indicate more particles and that they've warned about
18 airborne contamination in older devices as well as the
19 505 to the FDA, that would have no bearing on your
20 opinions in this case.

21 MR. GOSS: Objection to form.

22 A. Not -- not based on the -- the information
23 I've reviewed.

24 Q. And it is possible that your methodology is
25 incorrect and the other ones are correct in --

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<p style="text-align: right;">Page 133</p> <p>1 MR. GOSS: Objection.</p> <p>2 Q. -- in getting the results; correct?</p> <p>3 MR. GOSS: Object to form.</p> <p>4 A. It -- it's possible.</p> <p>5 Q. I mean you did not perform any statistical</p> <p>6 analysis to see whether or not your results were even</p> <p>7 statistically significant; correct?</p> <p>8 A. As I said before, I did not do any</p> <p>9 statistical analysis.</p> <p>10 Q. You only -- you only took one temperature</p> <p>11 measurement for each of the times listed on Exhibit B;</p> <p>12 correct?</p> <p>13 A. That's not correct. I took multiple</p> <p>14 temperature measurements at some locations.</p> <p>15 Q. Yeah. But you listed the different times of</p> <p>16 those temperature measurements; correct?</p> <p>17 A. Yes.</p> <p>18 Q. Okay. And you did not --</p> <p>19 You only did one test; correct? You didn't</p> <p>20 do this multiple times; correct?</p> <p>21 A. One -- one day.</p> <p>22 Q. One day. Okay.</p> <p>23 By the way, who is the patient who was</p> <p>24 laying down on the -- on the -- in -- on the table?</p> <p>25 A. It's a mannequin. I don't remember his</p>	<p style="text-align: right;">Page 135</p> <p>1 want to reduce the --</p> <p>2 The purpose of an operating room is to</p> <p>3 reduce the number of particles over the surgical site</p> <p>4 because that's the belief, that if you reduce</p> <p>5 particles, you're going to reduce colony-forming units</p> <p>6 over the surgical site; correct?</p> <p>7 MR. GOSS: Object to form.</p> <p>8 A. That -- that's one of the intents of a</p> <p>9 clean -- of an operating room, yes.</p> <p>10 Q. What's the other?</p> <p>11 A. To maintain surfaces as -- as clean as</p> <p>12 possible in addition just to the air.</p> <p>13 Q. Okay. And the -- the surface of the air,</p> <p>14 you want to reduce particles because particles carry</p> <p>15 bacteria.</p> <p>16 A. Air can contain bacteria-laden particles,</p> <p>17 yes.</p> <p>18 Q. Okay. And do you agree that if an engineer</p> <p>19 is aware that the Bair Hugger device can -- has -- has</p> <p>20 a risk of airborne contamination in the operating</p> <p>21 room, it would be unethical for the engineer not to</p> <p>22 warn the doctors of the potential airborne</p> <p>23 contamination?</p> <p>24 MR. GOSS: Objection to form, beyond the</p> <p>25 scope of his opinions in this case.</p>
<p style="text-align: right;">Page 134</p> <p>1 name.</p> <p>2 Q. Okay. So it was a mannequin?</p> <p>3 A. Yes.</p> <p>4 Q. Okay. Now according to your results, you</p> <p>5 would not expect increased particles over the surgical</p> <p>6 site when the Bair Hugger is turned on; correct?</p> <p>7 A. That's correct.</p> <p>8 Q. You understand that particles are very</p> <p>9 important to surgeons in an operating room; correct?</p> <p>10 A. I would think a subcategory of particles</p> <p>11 would be if they're carrying bacteria, yes.</p> <p>12 Q. I understand that. But if you have zero</p> <p>13 particles, you're going to have zero bacteria.</p>	<p style="text-align: right;">Page 136</p> <p>1 A. Again, the engineer is working in a group,</p> <p>2 typically a design group with management, safety</p> <p>3 people. I'm not sure how much information would</p> <p>4 actually be obtained by the -- by the engineer and how</p> <p>5 the engineer would -- would know how to respond.</p> <p>6 Q. Well let's take it as a corporation then. A</p> <p>7 corporation --</p> <p>8 It would be unethical for a corporation not</p> <p>9 to warn a consumer of a device of potential risks;</p> <p>10 correct?</p> <p>11 MR. GOSS: Same objections.</p> <p>12 A. Depends on what the perceived risks would be</p> <p>13 and -- and how important they would be to the -- to</p>
<p>14 MR. GOSS: Objection.</p> <p>15 Q. A bacteria is a particle; correct?</p> <p>16 MR. GOSS: Object to form.</p> <p>17 A. Well aerosolized bacteria is an aerosol</p> <p>18 particle, yes.</p> <p>19 Q. Okay. And -- and I mean even in a clean</p> <p>20 room, that's why you check for particles because</p> <p>21 you -- you know, you might not know what the particle</p> <p>22 is, but it may -- may or may not be something bad;</p> <p>23 correct?</p> <p>24 A. Yes.</p> <p>25 Q. Okay. Same thing in an operating room. You</p>	<p>14 the product.</p> <p>15 Q. Well, so if 3M informs the FDA that there's</p> <p>16 a potential for airborne contamination in using the</p> <p>17 device but they didn't warn the consumers, the doctors</p> <p>18 of the hospitals, of the potential risk, that would be</p> <p>19 unethical; correct?</p> <p>20 MR. GOSS: Same objection, lack of</p> <p>21 foundation, --</p> <p>22 A. Again, it --</p> <p>23 MR. GOSS: -- assumes facts.</p> <p>24 A. It would depend on the level of risk.</p> <p>25 Q. Okay. And to understand the level of risk,</p>

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1 you would have to understand the requirements of the
2 orthopedic surgeon in this case with respect to what
3 would be a risk that would be acceptable.
4 MR. GOSS: Same objection.
5 **A. Again, I'm not sure who would make the**
6 **judgment call as to what -- what risk would be**
7 **acceptable or not.**
8 Q. Well you agree with me that engineers and --
9 and the corporations they work for should not hide
10 danger from the customers that purchase their
11 products; correct?
12 **A. Again, as -- as with danger, I think it**
13 **would be what level of -- of danger. There is almost**
14 **danger in every product, so it's a question of what --**
15 **what's sufficient to alert potential users.**
16 Q. And that's why we have warnings; correct?
17 **A. Yes.**
18 **(Ms. Bantia enters the deposition room.)**
19 MR. GOSS: Do you want to go off the record
20 for just a second?
21 MR. ASSAAD: Sure.
22 THE REPORTER: Off the record, please.
23 (Luncheon recess taken.)
24
25

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1 AFTERNOON SESSION
2 BY MR. ASSAAD:
3 Q. Are you ready to continue?
4 **A. I am.**
5 Q. Before we begin, is there anything that you
6 want to change in your testimony that's been given to
7 date -- given to date at this time?
8 **A. Not that I know of, no.**
9 Q. Okay. Now you agree with me that an
10 engineer or a company should not hide relevant
11 information from customers; correct?
12 **A. Well I guess it depends on what you mean by**
13 **"relevant."**
14 Q. Well if -- if there's certain information
15 that a customer wants regarding, say, for example,
16 filtration efficiency of the Bair Hugger filter, 3M
17 should not hide that information from them; correct?
18 MR. GOSS: Objection, form.
19 **A. It would de -- it would depend on whether**
20 **there's competitive issues between different product**
21 **manufacturers; for example, one would not want to**
22 **release proprietary information that may give them a**
23 **competitive disadvantage.**
24 Q. Are you aware of any situation where a
25 filter efficiency used in a product is proprietary

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1 information?
2 MR. GOSS: Objection to form, foundation.
3 **A. I -- I cannot think of anything, no.**
4 Q. Okay. And you agree with me that hospitals,
5 when they use medical devices in their operating
6 rooms, might want to know the filter efficiency of a
7 Bair Hugger device; correct?
8 MR. GOSS: Objection to form, foundation.
9 He doesn't work in a hospital.
10 **A. I -- I -- again, I don't -- I don't know how**
11 **to answer that.**
12 Q. You've worked on clean rooms before;
13 correct?
14 **A. Semiconductor-manufacturing clean rooms.**
15 Q. And actually, one of the students
16 actually --
17 You worked -- worked on a case for doing
18 numerical -- a numerical simulation of airflow and
19 airborne pathogen transport in a -- in a operating
20 room; correct?
21 **A. It may have been a patient isolation room or**
22 **patient protection room.**
23 Q. Okay. And you're aware -- you're aware
24 that, especially for clean rooms, that filtration and
25 particle -- particle flow are relevant to the company

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1 that's using the clean room; correct?
2 **A. That's the purpose of the clean room, yes.**
3 Q. Okay. And the same thing for an operating
4 room, it's relevant information of how well the
5 filtration is and the quality of the filters being
6 used.
7 MR. GOSS: Object to form.
8 **A. I'm not --**
9 **I can't comment on all equipment in the --**
10 **in the hospital. I can comment on the filters**
11 **supplying the air to the room.**
12 Q. But you understand --
13 Well how does a clean room work?
14 **A. Well a clean room tries to provide clean air**
15 **that meets minimum requirements, and that clean air**
16 **then passes through the critical areas of -- of the**
17 **room and hopefully pretense -- prevents contamination.**
18 Q. And what would be the critical area in an
19 op -- in a clean room?
20 **A. In a semiconductor-manufacturing clean room**
21 **I'm most familiar with, it's the top surface of the**
22 **clean bench where wafers are being processed.**
23 Q. Okay. And based on your work on this case,
24 what do you consider the critical areas in an
25 operating room?

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<p style="text-align: right;">Page 141</p> <p>1 A. I would say the most critical area is 2 probably the surgical zone. 3 Q. What about the table where the equipment 4 sits and the instruments? 5 A. I would say that's not as important as -- as 6 the -- the surgical site. 7 Q. But you believe it's important though. 8 A. I think everything in an OR should be as -- 9 as clean as -- as minimum requirements dictate. 10 Q. Now as a manufacturer of -- of the Bair 11 Hugger device, if a customer is evaluating a device to 12 be used in the operating room, such as the Bair 13 Hugger, and wants to know what the filter efficiency 14 is, do you think the company should provide that 15 information to the customer? 16 MR. GOSS: Objection to form, beyond the 17 scope of his opinions. 18 A. As I said before, it depends on what the 19 company perceives to be proprietary information and 20 whether that -- they should divulge that or not. 21 Q. Do you know whether or not 3M perceives the 22 filter efficiency as proprietary? 23 A. I cannot comment on that. 24 Q. Do you know that 3M -- 25 You've read the manual for the 775; correct?</p>	<p style="text-align: right;">Page 143</p> <p>1 most of my research on. 2 Q. So you agree with me that the term "high 3 efficiency" is meaningless without the specification 4 of the size of the particle and the efficiency -- the 5 filtration efficiency for that size; correct? 6 MR. GOSS: Object to form. 7 A. That -- that would be very useful 8 information to have. 9 Q. What? 10 A. That would be very useful information to 11 have. 12 Q. Well if I told you this filter here is high 13 efficiency without knowing for what particle size I'm 14 referring to or the efficiency level for that particle 15 size, "high" -- "high efficiency" is meaningless. 16 A. It's -- it's -- it's not quantitative, yes. 17 Q. Okay. So you agree with me that it's 18 meaningless -- 19 MR. GOSS: Object to form. 20 Q. -- for people in the field. 21 A. I -- I would say it's not meaningful, it's 22 just not -- not quantified so it could be compared 23 with another filter type. 24 Q. I mean you could be high efficiency for -- 25 for particles size -- the size of tennis balls but not</p>
<p style="text-align: right;">Page 142</p> <p>1 A. Yes. 2 Q. And it states it uses a .2 high-efficiency 3 filter; correct? 4 A. I do not recall that level of detail without 5 seeing a document in front of me. 6 Q. Well in the -- you -- you work -- 7 You've worked with ASHRAE 52.2; correct? 8 A. That's correct. 9 Q. And you've actually -- you actually have a 10 test lab for ASHRAE 52.2 that meets the standards of 11 that -- of the testing for the filtration; right? 12 A. That's correct. 13 Q. Okay. When you say "a high-efficiency 14 filter," does that have any meaning in the engineering 15 world? 16 A. In terms of the filtration I'm most familiar 17 with, which is building ventilation filtration, it 18 means a fairly high MERV number. 19 Q. When you say "high MERV number," can you 20 give me a range? 21 A. Probably 13, 14. 22 Q. Okay. And when you say it's a .2 23 high-efficiency filter, what does that mean? 24 A. I am not quite sure what that means. It 25 doesn't relate to the ASHRAE Standard 52.2 that I base</p>	<p style="text-align: right;">Page 144</p> <p>1 high efficiency for bacteria; correct? 2 A. That's -- 3 Yes. 4 Q. Okay. So there's no really -- 5 There's no information, technical 6 information you could get from the term "high 7 efficiency" unless you know for what particle size and 8 the percentage of efficiency; isn't that correct? 9 A. I would need that information to -- to 10 quantify the performance, yes. 11 Q. And you need to quantify it before you could 12 deem it as high efficiency; correct? 13 MR. GOSS: Object to form. 14 A. I would think so, yes. 15 Q. So if you hear the term ".2 high 16 efficiency," does that give you any information -- "a 17 .2 micron high efficiency filter," does that give you 18 any information as to what the efficiency is at .2 19 microns? 20 A. It -- it does not give me any quantitative 21 information, no. 22 Q. Would you consider a filter that only has a 23 60-percent filter efficiency for -- for .2 microns 24 high efficiency? 25 A. Again, the "high efficiency" term depends</p>

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1 on -- on the size particle it's being used against and
2 what the application is.

3 Q. I'm asking you, a .2 micron filter,
4 high-efficiency filter that only has a 60-percent
5 filter efficiency for .2 microns, do you consider that
6 high efficiency?

7 A. It could be in other ranges of particle
8 sizes, yes.

9 Q. I'm saying for .2 micron.

10 A. Well for only .2 micron, .63 seems a bit
11 low.

12 Q. When you say .63, that's what you've seen in
13 the documents for 3M; correct?

14 A. Yes.

15 Q. Okay. And in fact, that is why ASHRAE came
16 up with the MERV rating, so you could determine the
17 efficiencies for different-size particles based on the
18 MERV rating; correct?

19 A. Yes. The MERV --

20 The Standard 52.2 was developed to
21 determine -- to provide filter efficiency versus
22 particle size, yes.

23 Q. Because that would be important in
24 determining what type of filter would be needed for a
25 certain application when an engineer decides in the

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1 Q. Yes. But infections travel on particles;
2 correct?

3 A. Yes.

4 Q. Okay. And that's something relevant to
5 people that design operating rooms and people that use
6 operating rooms; correct?

7 A. Yes.

8 Q. Okay. And the fact that increased
9 particles -- strike that.

10 You would agree with me that surgeons as
11 well as hospitals do not want to increase particles
12 over a surgical site; correct?

13 MR. GOSS: Lack of foundation.

14 A. I -- I really don't -- I --

15 I'm not a surgeon. I don't have an opinion
16 on that.

17 Q. You agree that in clean rooms, the
18 manufacturers that use the clean rooms do not want
19 increased particles over the critical areas; correct?

20 A. That statement is correct, because almost
21 any particle of any size would be detrimental.

22 Q. Okay. Do you know whether or not orthopedic
23 surgeons consider increased particles over the
24 surgical site relevant?

25 A. I -- I have no direct information on that.

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1 design what type of filter to use; correct?

2 A. That's correct.

3 Q. Assuming that 3M admits that every single
4 study performed by 3M or other researchers indicate
5 that when the Bair Hugger is turned on it increases
6 the particles over the surgical site, do you believe
7 that is relevant information that a consumer of the
8 Bair Hugger should know?

9 MR. GOSS: Object to form.

10 A. Just saying the particle concentration is
11 increased does not -- does not infer potential
12 hazards; for example, biological particle-number
13 increase.

14 Q. That wasn't my question, sir. Do you
15 believe the --

16 Do you agree that the consumer of the Bair
17 Hugger is going -- is -- is --

18 3M knows that it's going to be used in an
19 operating room; correct?

20 A. Yes.

21 Q. And the purpose of the operating room as
22 well as the clean room is to reduce the particle
23 counts over the critical areas; correct?

24 MR. GOSS: Object to form.

25 A. You're saying infectious particle counts.

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1 I'm not an orthopedic surgeon.

2 Q. Well let's assume that orthopedic surgeons
3 care about particles and any increase in particles
4 over the surgical site for this question. Fair
5 enough?

6 A. We'll make that assumption, yes.

7 Q. Okay. Do you agree with me that if 3M is
8 aware that the Bair Hugger increases particles over
9 the surgical site, that that's relevant information
10 they should inform their customers?

11 MR. GOSS: Objection to form.

12 A. Again, following the assumption we've made
13 earlier, yes.

14 Q. Okay. And did you ever look into the
15 issue -- well you've never heard about the --

16 3M never provided any of these studies,
17 correct, --

18 MR. GOSS: Objection, vague.

19 Q. -- regarding particle counts?

20 A. None other than what I've listed in my -- in
21 my report.

22 Q. Well none of the studies listed in your
23 report deal with particle counts over the surgical
24 site; correct?

25 A. I'd have to go back and -- and look to make

37 (Pages 145 to 148)

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1 **sure.**
 2 Q. Well are you aware sitting here today that
 3 there are any studies --
 4 I mean you haven't read the McGovern study;
 5 correct?
 6 **A. That's correct.**
 7 Q. And you haven't read any of the Legg
 8 studies; correct?
 9 **A. That's correct.**
 10 Q. Okay. And are you aware that 3M has done no
 11 studies internally with respect to whether or not the
 12 Bair Hugger increases particle counts?
 13 **A. I have no information on that.**
 14 Q. Assuming that when the Bair Hugger is turned
 15 on there is an increase in particle counts over the
 16 surgical site, does that have any relevance to your
 17 opinions?
 18 **A. Again, as I said, increase of particles**
 19 **could represent a particle that has nothing to do with**
 20 **surgical infections.**
 21 Q. I'm not talking about surgical infections,
 22 I'm talking about the fact that when the Bair Hugger
 23 is off there is X amount of particles and when the
 24 Bair Hugger is turned on there is X plus Y particles
 25 over the surgical site, an increase. Does that have

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1 Q. Why not?
 2 **A. Because I don't think it has -- has a**
 3 **bearing on the infectious particles that are going to**
 4 **be causing the concern associated with this case.**
 5 Q. But sitting --
 6 Why do you say it doesn't have a bearing on
 7 the infectious particles? What's your basis behind
 8 that?
 9 **A. Because an increase in particle size -- or**
 10 **increase in particle numbers, again not being defined**
 11 **at this point, could be just increases in very small**
 12 **particles, which is perhaps the case, with -- with**
 13 **nothing -- nothing correlated to hospital infections.**
 14 Q. But you're not a hospitalist or an
 15 infectious disease expert; correct?
 16 **A. I'm not, yes.**
 17 Q. But would it at least indicate to you that
 18 the Bair Hugger has an effect on the HVAC system in
 19 the operating room?
 20 MR. GOSS: Object to form, --
 21 **A. It --**
 22 MR. GOSS: -- calls for speculation.
 23 **A. It may have.**
 24 Q. Well from an engineering standpoint, I have
 25 X amount of particles with the Bair Hugger off over

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1 any relevance to your opinions today?
 2 **A. I'd have to look at the reports and the --**
 3 **and the data collected in order to evaluate whether it**
 4 **would be important or not.**
 5 Q. Well what would you need to look at?
 6 **A. I would need to look at their methodology**
 7 **and their data-collection techniques and -- and data**
 8 **reduction.**
 9 Q. Are you familiar with TSI?
 10 **A. I am.**
 11 Q. Are you -- are you -- are you familiar with
 12 their particle counters?
 13 **A. Yes.**
 14 Q. Do you think they're accurate particle
 15 counters?
 16 **A. When they're used appropriately and --**
 17 **Yes.**
 18 Q. Okay. And if -- you agree -- is
 19 And if the setup is identically -- is
 20 identical, so the particle counter is in the same
 21 place, same setup in an operating room, the only
 22 difference is Bair Hugger off and Bair Hugger on, and
 23 you see an increase, would that -- would that affect
 24 your opinions in this case?
 25 **A. No.**

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1 the surgical site, I turn the Bair Hugger on and there
 2 is a significant increase in particles, statistically
 3 significant, --
 4 Okay?
 5 **A. Okay.**
 6 Q. -- what would be the cause of that?
 7 **A. Again, if it's a carefully controlled study,**
 8 **it -- it could be sole -- solely due to the Bair**
 9 **Hugger.**
 10 Q. Well if the only difference is Bair Hugger
 11 off, Bair Hugger on, that's the only thing that's
 12 changed, what other cause could it be?
 13 MR. GOSS: Objection, incomplete
 14 hypothetical.
 15 **A. Again, it could be differences in other --**
 16 **other conditions.**
 17 Q. Well the only condition that's changed is
 18 the Bair Hugger on and Bair Hugger off. What other
 19 conditions could change in an operating room?
 20 **A. Again --**
 21 MR. GOSS: Object to the form.
 22 **A. Again, the methodology used could bias the**
 23 **particle counts towards -- towards one size or**
 24 **another. So total particle counts coming into the**
 25 **sampler could remain the same, but their size is**

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1 different. That could result in different outputs
 2 from the -- from the instrument.
 3 Q. Have you ever heard of a DIN standard?
 4 A. Yes.
 5 Q. Have you -- have you heard of the DIN
 6 standard before today -- before getting involved in
 7 this case?
 8 A. Yes.
 9 Q. How do you know about the DIN standard?
 10 A. I'm -- I'm peripherally aware of it. I
 11 don't know very much about the details.
 12 Q. Okay. Have you reviewed the DIN standard
 13 before?
 14 A. I don't believe I have.
 15 Q. Well do you have any reason to disagree with
 16 its methodology?
 17 A. Not having looked at it, no.
 18 Q. Okay. And that's a standard that -- that
 19 evaluates operating rooms and its effect -- its
 20 protective effect of removing particles; correct?
 21 A. Again, not --
 22 MR. GOSS: Object to form.
 23 A. -- having read the document, I don't know.
 24 Q. Well assuming the study was properly done
 25 and there was an increase in particles as a result of

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1 Q. Okay. So it will have no effect on your
 2 testimony.
 3 A. Yes.
 4 Q. Okay. Are you aware that 3M did not want to
 5 disclose the filtration level of its filters to its
 6 customers?
 7 MR. GOSS: Objection to form.
 8 A. I -- I did not know that.
 9 Q. Do you think that's ethical?
 10 MR. GOSS: Objection to form, beyond the
 11 scope of his opinions in this case.
 12 A. As I mentioned before, it depends on a
 13 number of factors, including any proprietary
 14 information.
 15 Q. You don't think a hospital has a right to
 16 know what the filtration of a filter is in a medical
 17 device that's used in the operating room?
 18 MR. GOSS: Objection to form. He's not here
 19 to testify about anybody's rights.
 20 Q. Is that what you're saying here?
 21 A. Again, I -- I -- I cannot comment on a
 22 hospital's position.
 23 Q. As a patient, do you think a patient would
 24 want to know whether or not a filter is fil --
 25 filtering bacteria from a device that blows air on

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1 the Bair Hugger, is it your testimony today that that
 2 has no effect on your opinion that the Bair Hugger has
 3 no effect on the airflow in an operating room?
 4 MR. GOSS: Asked and answered.
 5 A. And I think I've already answered that.
 6 Q. Please answer it again.
 7 A. I -- I -- I will stand by my opinion.
 8 Q. Which is?
 9 A. Which is the Bair Hugger has negligible
 10 influence on the airflow near the surgical site.
 11 Q. That wasn't -- that wasn't my question, sir.
 12 Please answer my question.
 13 My question is: Assuming that the
 14 methodology and the peer-reviewed studies are correct
 15 and that there is an increase in particles over the
 16 surgical site when the Bair Hugger is on as compared
 17 to when it's off, are you saying, your testimony
 18 today, that it has no effect on your opinion that the
 19 Bair Hugger has a negligible effect on the surgical
 20 site?
 21 MR. GOSS: Objection to form, calls for
 22 speculation without seeing the study.
 23 A. Again, I would stand by my -- my testimony.
 24 Q. Which is?
 25 A. Which is -- which is no.

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1 their body during a surgical operation?
 2 A. I don't think a patient would have any idea
 3 of that, unless they're involved in the procedure
 4 somehow.
 5 Q. The fact that 3M admits that every study
 6 indicates that the Bair Hugger increases the particle
 7 count over the sterile -- ster -- sterile field and
 8 that they have no internal studies to refute that has
 9 no bearing on your opinion today?
 10 MR. GOSS: Object to form.
 11 A. Not having seen all the studies, no, I can't
 12 comment on that.
 13 Q. Well this is what 3M admits in a 30(b)(6)
 14 corporate representative deposition. They admit that
 15 all the studies --
 16 They didn't say they're incorrect. They
 17 said all the studies indicate this and they have no
 18 data to refute that. That has no bearing on your
 19 opinion today?
 20 MR. GOSS: Objection to form, lack of
 21 foundation.
 22 A. Again, not having seen the data, I -- I do
 23 not want to comment.
 24 MR. ASSAAD: I'm not going to mark this, but
 25 can we put this on the screen?

39 (Pages 153 to 156)

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1 THE VIDEOGRAPHER: Put it in front of the
2 witness.
3 Q. Take a look at the highlighted area and read
4 it aloud for the record.
5 A. Okay. I'm reading what -- what it says,
6 page 258. It says:
7 "Q. Okay. Based on the data that we have
8 today, including the study funded by 3M as well as
9 other studies, every single study indicates that the
10 Bair Hugger increases the particle count over the
11 sterile field; correct?"
12 This is A. in bold: "In absolute numbers,
13 yes."
14 And then: "Q. Yes. Okay. And you have no
15 internal studies to refute that; correct?"
16 And there's "A. No, we don't."
17 Q. And you're sitting here today and your
18 testimony is that as a corporate statement by 3M under
19 penalty of perjury in this litigation, that in -- that
20 information would have no effect on your opinion today
21 whether or not the Bair Hugger has any effect on the
22 airflow in an operating room.
23 MR. GOSS: Asked and answered.
24 A. I would request to see the actual results
25 myself.

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1 Q. Did you ask for the -- any data?
2 A. I did not know they existed, so no, I did
3 not ask for them.
4 Q. It's not enough for you that 3M admits it
5 in a -- in a -- under penalty of perjury?
6 MR. GOSS: Objection to form, asked and
7 answered.
8 A. I think I've answered that already.
9 Q. So it's not important that 3M admits it to
10 you?
11 Well is there anything that -- let --
12 Let's be honest, doctor. It's quite clear
13 that you're finding out for the first time other
14 studies and other information regarding the issues in
15 this case that have not been provided to you; correct?
16 MR. GOSS: You can answer.
17 A. Yes.
18 Q. And you agree that to be objective in
19 formulating opinions, that you should have all the
20 studies and all the information relevant to the issues
21 of your opinions; correct?
22 A. All the information that -- that I think is
23 important, yes.
24 Q. And other studies by 3M as well as other
25 researchers regarding the effect of the Bair Hugger on

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1 the airflow in an operating room is relevant in this
2 case; isn't it?
3 A. Yes.
4 Q. Especially ones done by 3M, which you can't
5 even claim any bias towards because it was conducted
6 and funded by 3M.
7 MR. GOSS: Objection to form.
8 Q. Do you agree?
9 A. I agree there's -- there's no bias
10 associated with that.
11 Q. Okay.
12 (Kuehn Exhibit 7 was marked for
13 identification.)
14 BY MR. ASSAAD:
15 Q. Marked as Exhibit 7 is an e-mail chain
16 between Michelle Stevens, Mark Scott, Ms. Soria, Scott
17 Waite, and Mark Morken.
18 I -- I assume, Dr. Kuehn, that you've never
19 seen this document before; correct?
20 A. That's correct.
21 Q. Okay. If you want a --
22 Do you want a minute to review this
23 document, or I'll just ask you some questions?
24 A. Let me just quickly page through it.
25 MR. GOSS: Looks like it starts on --

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1 The first message is on page 89, the one
2 ending in 89.
3 A. Okay.
4 Q. I want you to read the sentence regarding --
5 from Mark Morken to Scott Waite and Michelle Stevens.
6 It states on the second line --
7 A. Wait. Where are you?
8 Q. First page.
9 Well first of all, if you look at the
10 subject, it states "Message to address safety and
11 efficacy of forced air warming." Do you see that?
12 A. At the top of the first page, yes.
13 Q. Yes. And I -- and I -- and I represent this
14 is --
15 They're discussing whether or not to do the
16 study to determine the safety and efficacy of forced-
17 air warming in this e-mail, based on the subject.
18 A. Something dealing with safety and efficacy,
19 yes.
20 Q. And the response by 3M is, "What are -- What
21 are his findings and own data? Also we would need to
22 really understand what type of study is being
23 proposed. Giving -- Given the ongoing legal
24 situation, decisions were made previously (at a high
25 level) not to pursue clinical research work on this

40 (Pages 157 to 160)

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1 topic."

2 **A. I see that.**

3 Q. Did I read that correctly?

4 **A. Yes.**

5 Q. Remember we talked about previously that it
6 would be unethical for an engineer to -- to not do
7 research regarding the safety of a device solely based
8 on litigation?

9 MR. GOSS: I'm going to object to form on
10 the ground that he's not offering any opinions on
11 clinical research or research ethics or engineering
12 ethics.

13 Q. Do you recall that conversation?

14 **A. I do.**

15 Q. Do you agree with me that for a company to
16 allow litigation to -- to prevent them from doing
17 research on the safety and efficacy of a device is
18 unethical?

19 MR. GOSS: Also going to object to lack of
20 foundation with this document.

21 **A. Well again, "decisions were made...(at a
22 high level)...," I don't -- I don't see the direct
23 correlation to any engineers there.**

24 Q. So if it's not an engineer it could be
25 ethical, but if it's an engineer it could be

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1 lack of foundation with this issue.

2 Q. Do you believe such a course of action is
3 ethical? "Yes" or "no."

4 **A. Again, without any information on the legal
5 ramifications and the decisions made, I -- I really
6 don't know.**

7 Q. So sitting here today, you don't know
8 whether or not, when -- when decisions are made at a
9 higher level not to pursue research on the safety of a
10 device as a result of a legal situation, you have no
11 opinion whether or not that's ethical or not, ethical
12 based on your testimony before?

13 MR. GOSS: Objection, assumes facts not in
14 evidence, in fact contrary to evidence, and lack of
15 foundation.

16 MR. ASSAAD: You can answer the question.

17 **A. Again, I have no information on what was
18 being discussed legally regarding this case and how
19 that impacted their decision.**

20 Q. Well isn't that contrary to what you stated
21 previously in this deposition?

22 MR. GOSS: Objection, form, mischaracterizes
23 his testimony.

24 Q. Do you want to go to your testimony? Would
25 that be helpful?

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1 unethical; is that your testimony?

2 MR. GOSS: Same objection, it's also
3 argumentative.

4 **A. I thought you were referring to engineering
5 ethics.**

6 Q. Well engineers make devices; correct?

7 **A. Yes.**

8 Q. Okay. So assuming that there are engineers
9 at a higher level, do you agree that it would be
10 unethical to -- to not pursue research on the safety
11 and efficacy of a device based on -- on an ongoing
12 legal situation?

13 MR. GOSS: Same objections.

14 **A. The last sentence says, "Given the ongoing
15 legal situation..." I'm not aware of the legal issues
16 that would be involved in this and how that would play
17 into the -- the decision.**

18 Q. It's this case. That's the legal situation.
19 Okay?

20 **A. Yes.**

21 Q. Assume that. And assume it says "not to
22 pursue clinical research work on this topic," and we
23 could agree that the topic is "Message to address
24 safety and efficacy of forced air warming."

25 MR. GOSS: Object to the witness's complete

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1 MR. GOSS: What's -- what's the question?

2 **A. Yes. What --**

3 Q. Remember the question I asked you:
4 Engineers should not take into account -- oh,
5 strike -- strike that.

6 Engineers, in determining the safety of a
7 device, should not consider potential litigation, and
8 you agreed with that statement?

9 **A. I -- I -- I may have.**

10 MR. GOSS: Improper impeachment.

11 **A. I -- I -- I --**

12 **If it was a statement I made earlier today,
13 I would have to go back and look at the record.**

14 Q. Do you think your answer is different now
15 since you've seen this document?

16 MR. GOSS: Objection to form, improper
17 impeachment.

18 **A. I don't -- I don't think my answer would be
19 different.**

20 Q. Do you remember testifying earlier that a
21 company -- engineers and their company should not
22 suppress research regarding the safety of a device?

23 **A. I believe I said that, yes.**

24 Q. Okay.

25 (Kuehn Exhibit 8 was marked for

41 (Pages 161 to 164)

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1 identification.)
 2 BY MR. ASSAAD:
 3 Q. Exhibit 8 is an e-mail from Gary Hansen to
 4 Dave Westlin, Teri Woodwick-Sides, Jana Stender and
 5 John Rock.
 6 Do you know any of these people?
 7 A. I do not, no.
 8 Q. Do you know who ECRI is, E-C-R-I?
 9 A. I do not think I know that.
 10 Q. I'm just going to read the first line. "Our
 11 first step with ECRI should be preventing them from
 12 doing their own testing, but rather to rely on
 13 published data." Did I read that correctly?
 14 A. You read that correctly.
 15 Q. Do you think it's good for a company to try
 16 to prevent the gaining of knowledge of devices from
 17 outside companies that want to do research?
 18 MR. GOSS: Objection to form, I don't think
 19 that's what this sentence said, and beyond the scope
 20 of any opinions he's going to offer in this case.
 21 A. I -- I don't know what ECRI refers to.
 22 Q. And you weren't provided any documents from
 23 the defendant regarding ECRI or the history of -- of
 24 the situation with ECRI; correct?
 25 A. I was not.

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1 Q. I'm going to have you assume that ECRI is an
 2 independent organization. Do you agree -- assuming
 3 that fact, do you agree that one of the goals of 3M in
 4 this -- in -- in this e-mail is to prevent ECRI from
 5 doing their own testing?
 6 MR. GOSS: Objection to form, lack of
 7 foundation, assumes facts not in evidence, beyond the
 8 scope of any opinions he's going to offer in this
 9 case.
 10 A. Well I'd -- I'd have to do some
 11 interpretation. "Our first step" with this
 12 organization that I'm not familiar with, "should be
 13 preventing them" -- I'm assuming it's the
 14 organization -- "from doing their own testing, but
 15 rely on published data," so -- so it sounds to me like
 16 they're trying to prevent ECRI from doing some -- some
 17 testing; rather, rely on published data.
 18 MR. GOSS: You don't have to speculate about
 19 what the document says.
 20 MR. ASSAAD: Well the document speaks for
 21 itself I believe.
 22 MR. GOSS: That's right.
 23 Q. As -- as an engineer, you agree that -- well
 24 strike that.
 25 What do you know about Dr. Sessler?

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1 A. Not very much I would say. I certainly
 2 don't know him personally. I've heard the name.
 3 Q. Are you aware that Dr. Sessler has done a
 4 lot of work in the area of normothermia?
 5 A. I -- I was not aware of that.
 6 Q. So what do you --
 7 You've heard the name Dr. Sessler before.
 8 A. I think perhaps from counsel in this
 9 litigation.
 10 Q. So what is your knowledge of him besides
 11 knowing the name?
 12 A. That -- that's about it.
 13 Q. Are you aware that Dr. Sessler is on the
 14 advisory council for 3M?
 15 A. I did not know that.
 16 Q. Do you know what an advisory council does?
 17 A. Basically, yes.
 18 Q. What do they do?
 19 A. Provides advice to the company on generally
 20 broad issues, broad topics.
 21 Q. And companies hire advise -- advisory
 22 counsels to offer advice; correct?
 23 A. Yes.
 24 Q. Okay. Were you aware that -- that Dr.
 25 Sessler advised 3M on numerous occasions to perform

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1 more studies on the safety of the Bair Hugger device?
 2 A. I was not aware of that, no.
 3 Q. And are you aware that 3M disregarded all
 4 the advice that Dr. Sessler has given them regarding
 5 that issue?
 6 MR. GOSS: Objection to form, contrary to
 7 evidence.
 8 A. Since I'm not aware of the -- of his
 9 comments in the first place, I -- I can't comment on
 10 3M's response.
 11 (Kuehn Exhibit 9 was marked for
 12 identification.)
 13 MR. GOSS: Do you have another copy?
 14 MR. ASSAAD: Oh, I'm sorry.
 15 (Discussion off the stenographic record.)
 16 BY MR. ASSAAD:
 17 Q. This is an e-mail -- this is --
 18 Exhibit 9 is an e-mail from Gary Hansen to
 19 Dan Sessler -- or an e-mail chain between Gary Hansen
 20 and Daniel -- and Dr. Sessler. Have you seen this
 21 document before?
 22 A. I have not.
 23 Q. Dr. Sessler writes to -- Dr. Sessler writes
 24 to Gary Hansen, talks about Scott's paper, and that's
 25 Scott Augustine just for the record, "We were lucky

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1 that this was published at almost the same time as
2 Scott's paper. We may not have warning of his next
3 effort though. There is a very real possibility that
4 he will do some sort of bacterial sampling study (the
5 idea is obvious) and that the first we will know of it
6 is a published paper. If that happens, whatever Scott
7 reports will be un-opposed for one or two years while
8 we do a catch-up study, analysis, and get through the
9 publication process. Waiting much longer seems like a
10 dangerous strategy." And I represent they're talking
11 about doing an aerobiology study.

12 Do you know whether or not 3M has done an
13 aerobiology study on the Bair Hugger?

14 MR. GOSS: Objection to form, foundation.

15 **A. I -- I have no idea.**

16 **Q. Are you aware of any study that indicates**
17 **that the Bair Hugger device -- peer-reviewed study --**
18 **does not disrupt the airflow in an operating room?**

19 **A. Off the top of my head, no.**

20 **Q. Have you reviewed any articles, were**
21 **provided any articles of that nature?**

22 **A. No.**

23 **Q. Have you been -- have you been provided the**
24 **compendium created by 3M for marketing its Bair Hugger**
25 **device discussing all the research available?**

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1 **to see.**

2 **Q. Well you've formulated your opinions to see**
3 **whether or not the Bair Hugger has an effect on the**
4 **sterile field in an operating room; correct?**

5 **A. That's correct.**

6 **Q. So I assume you have to understand what the**
7 **issues in this case are; correct?**

8 **A. Yes.**

9 **Q. Which is the sterility of the sterile field**
10 **of an operating room; correct?**

11 **A. Yes.**

12 **Q. Okay. So you do agree that physicians want**
13 **to keep the sterile field as particle-free as**
14 **possible.**

15 **A. I would assume so.**

16 **Q. Okay. And that's not rocket science.**
17 **That's basically the issues in this case; correct?**

18 **A. Yes.**

19 **Q. Okay. I mean you didn't perform your study**
20 **or your -- your eval -- your opinion in a vacuum. You**
21 **understood the issues in this case before you**
22 **performed your study; correct?**

23 **A. Yes.**

24 **Q. And you were sent out to prove that the Bair**
25 **Hugger has a negligible effect on the sterile field in**

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1 MR. GOSS: Object to form.

2 **A. No.**

3 **Q. Are you aware that 3M has manipulated**
4 **studies?**

5 MR. GOSS: Objection, form, assumes facts.

6 **A. I have -- have no idea. I have not seen**
7 **the -- the report.**

8 **(Kuehn Exhibit 10 was marked for**
9 **identification.)**

10 BY MR. ASSAAD:

11 **Q. What's been marked as Exhibit 10 is an**
12 **e-mail chain between Dr. Sessler, Gary Hansen and Russ**
13 **Olmstead.**

14 **Do you know who Russ Olmstead is?**

15 **A. I do not.**

16 **Q. The first sentence of the top e-mail chain**
17 **of the second -- the second paragraph, first sentence**
18 **says, "What clinicians will want to see is basically**
19 **particle counts under the three test circumstances**
20 **(Off, Ambient and Warm)." Do you see that?**

21 **A. I see that.**

22 **Q. Do you disagree with that statement at all?**

23 MR. GOSS: Objection to form, lack of
24 foundation. He's not a clinician.

25 **A. I -- I'm not sure what clinicians would want**

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1 an operating room; correct?

2 MR. GOSS: Objection to form.

3 **A. I actually determined that based on my**
4 **experimental measurements from the Bair Hugger oper --**
5 **in operation.**

6 **Q. But that was your working hypothesis;**
7 **correct?**

8 MR. GOSS: Objection to form.

9 **A. I was open to whatever the results were**
10 **that -- that I measured in the lab.**

11 **Q. But as a scientist, you agree that before**
12 **you perform any scientific study, you usually have a**
13 **working hypothesis; correct?**

14 **A. There's usually some -- some goal that**
15 **you're working towards.**

16 **Q. Okay. What was your working hypothesis in**
17 **this case?**

18 **A. To measure the actual -- in the lab, measure**
19 **the actual temperature and airflow rates out of the**
20 **Bair Hugger and determine if they were significant or**
21 **strong enough to go around the anesthetic -- anes --**
22 **anesthetic drape to get to the surgical site.**

23 **Q. Okay. That's not your hypothesis, that's**
24 **what you did. What was your hypothesis?**

25 **A. My hypothesis was that the airflow delivered**

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<p style="text-align: right;">Page 173</p> <p>1 would have negligible effect on the airflow of the 2 surgical site. 3 Q. Fair enough. So your hypothesis was that 4 the airflow had a negligible effect, and you did your 5 study to prove your hypothesis; correct? 6 MR. GOSS: Object to form. 7 A. The results I think showed that to be 8 correct. 9 Q. I understand that. But now we're both 10 engineers, we've both written papers. You have a 11 hypothesis and then you do your study to prove your 12 hypothesis to see if your hypothesis is correct or 13 not; correct? 14 MR. GOSS: Objection to form. 15 A. I -- I would say I was not -- I was not 16 proving a hypothesis set up ahead of time. I was 17 looking at the data that I collected and then, based 18 on that, determining my -- my position. 19 Q. So you never formulated a hypothesis before 20 you obtained your data. 21 A. I was open-minded in terms of what -- what 22 would happen. 23 Q. So the answer to my question is "correct." 24 MR. GOSS: Objection to form. He answered 25 the question.</p>	<p style="text-align: right;">Page 175</p> <p>1 Q. First paragraph, second sentence. 2 A. Okay. 3 Q. "The increase with the 635 cover on ambient 4 or warm in Amersfoort seemed substantial, roughly a 5 factor-of-five-to-ten." 6 A. I -- I think you -- 7 Q. Talking about particles here. 8 A. Well -- 9 MR. GOSS: Wait for a question. 10 Q. Do you agree that -- 11 Well let me ask you this: The effect 12 that -- withdraw that question. 13 Since you've never read the Sessler article 14 regarding particle counts funded by 3M, you have no 15 idea sitting here today what actually made it into the 16 published paper; do you? 17 A. That's correct. 18 Q. Do you think that if you obtained data that 19 showed that particle counts increased on a factor of 20 five to 10 when the Bair Hugger was ambient or warm, 21 that is a finding that should be published in an 22 objective, impartial study to be peer-reviewed? 23 MR. GOSS: Objection to form. 24 A. Potentially, uh-huh. 25 Q. Do you think it's ethical for a company to</p>
<p style="text-align: right;">Page 174</p> <p>1 A. I -- I did not have a goal in mind. I -- I 2 did the measurements I -- I performed, and based on 3 the results of the measurements, I used that to 4 support my -- 5 Q. And that's -- 6 I'm asking you: In your methodology, you 7 did not have a hypothesis before you started taking 8 measurements; correct? 9 A. Yes. 10 Q. I'll represent that Exhibit 10 is discussion 11 between Gary Hansen and Dr. Sessler and Russ Olmstead 12 discussing the Sessler paper of 2011 that 3M funded 13 and performed and which was published regarding 14 particle count using the DIN standard. 15 MR. GOSS: Objection to form. 16 MR. ASSAAD: Basis. 17 MR. GOSS: 3M didn't perform it. 3M 18 definitely funded it. 19 Arizant funded it. Sorry. Arizant funded 20 it. 21 Q. Do you see on the second line of the first 22 paragraph, "The increase with the 635 cover on ambient 23 or warm in Amersfoort seemed substantial, roughly a 24 factor-of-five-to-ten?" 25 A. Where -- where are you again?</p>	<p style="text-align: right;">Page 176</p> <p>1 fund research, analyze the data, and then give it to a 2 researcher to publish it? 3 MR. GOSS: Objection to form. He's not an 4 ethicist and he's not offering opinions on ethics. 5 MR. ASSAAD: This whole case is about 6 ethics. 7 A. It -- it's not uncommon for a company to 8 support research that then is sent back to the 9 corporation prior to publication, not for changing any 10 information per se, but there may be again some 11 proprietary issues with something that was -- was used 12 in the study that the company does not want released. 13 Q. But if I understand you correctly, it's okay 14 for the -- the researchers to send back the manuscript 15 to the corporation for them to change -- 16 MR. GOSS: Object to form, assumes facts. 17 Q. -- or edit? 18 A. I would say edit. 19 Q. So a corporation is allowed to edit the 20 substance of a research paper that they fund? 21 MR. GOSS: Objection to form. 22 A. Again, in my experience it's very common for 23 a researcher who is funded by a company to have an 24 agreement in writing before that project starts that 25 any information release would have to be approved by</p>

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1 the -- the funding agency or the company.
2 Q. I understand the release, but what about
3 editing, editing the content of -- of a manuscript?

4 A. I would say not changing the results. There
5 may be --

6 Again, something proprietary could be in
7 there that the company does not want released, but
8 that should not change the overall results of the
9 study.

10 Q. Okay. So -- so you'll agree with me that
11 a -- a researcher should not send back the manuscript
12 to the corporation that funded the research and give
13 them free reign to do any type of edit they want to
14 do; correct?

15 MR. GOSS: Objection, form, beyond the scope
16 of the opinions.

17 A. That -- that would be my --

18 Yes, I would agree with that.

19 Q. Because if it was done, that would lack
20 integrity in that paper; correct?

21 MR. GOSS: Same objection.

22 A. Well the original researchers would
23 hopefully have integrity. It's a question of what
24 happens after that. I would say that's not a -- that
25 would be a non -- a non-ethical decision.

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1 Q. It would not be ethical.

2 A. I agree.

3 Q. Okay. Have you heard of Hybeta?

4 A. I do not believe I have.

5 Q. Does the fact that Dr. Sessler indicated the
6 results show a factor of five to 10 increase in
7 particle counts when the Bair Hugger was on ambient or
8 on high -- or on warm, would that have any effect on
9 your opinions in this case?

10 MR. GOSS: Objection, assumes facts not in
11 evidence.

12 A. Without --

13 Not without having read the article.

14 Q. Okay. Going back to the last exhibit
15 talking about the particle counts being five to 10
16 times, --

17 A. Okay.

18 Q. -- are you aware that 3M deleted that
19 information from the final manuscript submitted for
20 publication?

21 MR. GOSS: Objection to form.

22 A. I have no information on that.

23 Q. Would you -- would that --

24 If that is the case, assuming that's the
25 case, do you agree that's unethical?

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1 MR. GOSS: Objection to form, beyond the
2 scope of his opinions. He's not an ethicist.

3 A. Well, I would probably agree with that.

4 Q. Sitting here today, do you have any
5 understanding or -- or -- or knowledge as to why you
6 were not provided most of the relevant peer-reviewed
7 literature in this case?

8 MR. GOSS: Objection, argumentative, calls
9 for speculation.

10 A. I was given a task that was fairly narrow in
11 scope, and that may have limited the amount of
12 information I was given.

13 Q. So your task was narrow in scope?

14 A. Yes, to look -- look at primarily the
15 filter -- filtration issues and -- and particle
16 movement on surfaces, and transport issues.

17 Q. Well you also calculated bouyancy using the
18 Archimedes number to see whether or not there would be
19 any effect on -- on air movement in the operating
20 room; correct?

21 A. That was in response to one of the expert
22 reports.

23 Q. So what -- what analysis did you do with
24 respect for you to come to your conclusion that the
25 Bair Hugger has a negligible effect on the airflow in

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1 the operating room?

2 A. Based on my measurements of the velocity
3 leaving the blanket primarily.

4 Q. Okay. So it's solely based on your Exhibit
5 B then.

6 A. Yes.

7 Q. That's it.

8 A. And knowledge of how operating rooms
9 typically work with air coming down through the
10 filters in the ceiling towards the surgical wound site
11 and the air from the blanket being emitted, I would
12 say, down -- on the downstream side of the surgical
13 drape.

14 Q. Okay. And we'll get to that in a little
15 bit. But let's talk about operating rooms. So you
16 understand that the --

17 Do you know what the term "environment of
18 use" is?

19 A. Yes.

20 Q. Have you ever used that term before?

21 A. I do not believe I have.

22 Q. Have you ever heard of it before?

23 A. I have heard of it before.

24 Q. And would you agree with me that when
25 designing any device, you have to look at what

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1 environment the device is going to be used in,
2 correct?
3 **A. That's correct.**
4 Q. And you understand that the -- the Bair
5 Hugger is being used in an operating room as well as
6 other areas, but it's also being used in an operating
7 room; correct?
8 **A. Correct.**
9 Q. Okay. And have you looked at the
10 environment of an operating room with respect to the
11 bacterial load in an operating room?
12 **A. I've not personally, no.**
13 Q. Could you agree with me that the bacterial
14 load, if we're talking about CFUs per meter cubed, is
15 not uniform throughout the operating room?
16 **A. I would agree with that.**
17 Q. A certain area is going to have a higher
18 bioburden than other areas; correct?
19 **A. Yes.**
20 Q. Could you agree with me that probably the
21 most -- the -- the area with the greatest bioburden is
22 probably around the surgical table?
23 **A. I --**
24 **Not having seen any data, I'm -- I'm**
25 **offering speculation, so I would not have a basis to**

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1 down through the ventilation and it's moving the
2 bacteria and the squames on a downward motion to the
3 floor; correct?
4 **A. Yes.**
5 Q. Okay. So you agree with me that from
6 engineering common sense, that the area with the least
7 amount of bioburden is probably the air coming from
8 the vents in an operating room.
9 **A. That's certainly one of the areas of low**
10 **bioburden.**
11 Q. Okay. Have you heard the term "war games"
12 used by 3M?
13 **A. No.**
14 **(Kuehn Exhibit 11 was marked for**
15 **identification.)**
16 BY MR. ASSAAD:
17 Q. Exhibit 11 is an e-mail from Jana Stender to
18 John Rock, and attached to it is something called "war
19 games notes.docx." I assume you've never seen this
20 document before; correct?
21 **A. That's correct, I have not -- I have not**
22 **seen this before.**
23 Q. Were you aware -- if you look at the bottom
24 of page two, the fifth line up -- that 3M had a
25 concern that someone was going to do a real study on

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1 **agree with that.**
2 Q. Well will you agree that the bioburden,
3 which is bacteria, are usually coming off of
4 individuals, off their skin, as well as it could have
5 been not cleaned properly before, some areas of the
6 operating room; correct?
7 **A. And also coming through the filters in the**
8 **ceiling.**
9 Q. Okay.
10 **A. Other --**
11 Q. What do you think has a larger bioburden,
12 the air coming out of the ceiling or the air
13 underneath the operating room table?
14 **A. I have no basis to make an opinion on that.**
15 Q. Okay. So sitting here today, you can't use
16 your -- you can't use science and your engineering
17 education to determine, based on the airflow in an
18 operating room, whether or not the air coming out of
19 the ventilation system has a greater or lesser
20 bioburden than the air where there are a patient and
21 three or four people standing around a surgical table.
22 **A. Well I -- I cannot rely on any data, but I**
23 **can speculate that it would be -- the concentration**
24 **would be higher under the table.**
25 Q. And that would be because air is blowing

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1 forced-air warming and contamination?
2 **A. That -- that's what it says here.**
3 Q. Okay. Do you agree with me that, based on
4 the information that you've been provided today, that
5 there's no evidence that 3M performed any study to
6 determine whether or not the Bair Hugger contaminates
7 a sterile field?
8 MR. GOSS: Objection to form, lack of
9 foundation, beyond the scope of his opinions.
10 **A. Nothing that I've seen today, no.**
11 Q. And I assume that information is not
12 important to your opinions; correct?
13 **A. Not -- not based on how I developed my**
14 **opinions.**
15 Q. So if your opinions and your calculations
16 are contrary to peer-reviewed studies, you would still
17 stand by your opinions?
18 **A. I would say some peer-reviewed studies,**
19 **especially those dealing with particle measurements,**
20 **are often flawed because of a poor -- poor methodology**
21 **or -- or --**
22 Q. You're speculating though; correct?
23 MR. GOSS: Objection to form.
24 **A. Without -- well, without -- without reading**
25 **them, I'm speculating, yes.**

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1 Q. I mean you can't sit here today and say
2 whether or not the Legg study had poor methodology;
3 can you?
4 **A. Not --**
5 MR. GOSS: Show him the study.
6 MR. ASSAAD: I'm not going to show it to
7 him. You can show it to him. 3M could show it to
8 him.
9 MR. GOSS: Well you're asking him questions
10 about the study and he can only -- he can only
11 speculate --
12 MR. ASSAAD: No.
13 MR. GOSS: -- if you're not going to show
14 him.
15 Q. Sitting here today you could not state --
16 MR. ASSAAD: I'm sorry, Dick.
17 Q. Sitting here today you could not state
18 whether or not the 3M -- or the Legg study had poor
19 methodology; can you?
20 **A. I cannot state that because I've not seen**
21 **it.**
22 Q. Okay. And you --
23 Sitting here today, you could not say
24 whether or not the Sessler study funded by 3M had poor
25 methodology; correct?

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1 **A. Having not seen it, I could not say that,**
2 **yes.**
3 Q. And you can't sit here today and say the
4 McGovern study that had neutral-buoyant bubbles had
5 poor methodology; can you?
6 **A. Not having seen it, no, I cannot say that.**
7 Q. Are you aware that Gary Hansen stated in an
8 edit on a paper that there actually is evidence that
9 forced-air warming increases the risk of infection?
10 MR. GOSS: I think she's going to correct
11 you.
12 MR. ASSAAD: I'm sorry, Al Van Duren.
13 MR. GOSS: Object to form.
14 **A. I -- I -- I have not seen that.**
15 Q. You know Al Van Duren is still with the
16 company 3M; correct?
17 **A. I -- I did not know that.**
18 Q. Okay. Assuming that Al Van Duren, who is
19 upper-level management at 3M, stated, "Actually, there
20 is evidence that forced-air warming use increases
21 risk -- this evidence was the motivation behind Dr.
22 Memarzadeh's work," assuming that's correct, would
23 that affect your opinions in this case?
24 MR. GOSS: Objection to form.
25 **A. Could you repeat that again?**

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1 Q. Okay. Assuming that Al Van Duren, who is
2 upper-level management at 3M stated, "Actually, there
3 is evidence that forced-air warming use increases
4 risk" -- and they're talking about infections -- "this
5 evidence" -- dash "this evidence was the motivation
6 behind Dr. Memarzadeh's work." Assuming that's
7 correct, would that affect your opinions in this case?
8 MR. GOSS: Same objection.
9 **A. I would say no.**
10 MR. ASSAAD: Take a five-minute break?
11 MR. GOSS: Sure.
12 (Kuehn Exhibit 12 was marked for
13 identification.)
14 BY MR. ASSAAD:
15 Q. What's been marked as Exhibit 12 are
16 invoices that have been provided to me today which are
17 your March and May invoices to Blackwell Burke; is
18 that correct?
19 **A. Yes, that's correct.**
20 Q. And with respect to the invoices that we --
21 have been marked in today's deposition, that's all the
22 invoices that you have prepared so far in this case.
23 **A. That's correct, February through the first**
24 **of June.**
25 Q. Okay. On May 16th you indicate you

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1 "Reviewed 3M report, read ASHRAE HVAC design guide and
2 52.2."
3 **A. Yes, I believe that's what it says.**
4 Q. What's the ASHRAE HVAC design guide? Is
5 that for hospitals?
6 **A. Yes. Yes.**
7 Q. Is that the 2007 I think it was?
8 **A. I don't remember what version it was, but --**
9 Q. Second version?
10 **A. It's probably the most recent hospital**
11 **design guide.**
12 Q. Now let's go to your report, which is
13 Exhibit 1. I want to go to Exhibit 1 -- Exhibit A of
14 Exhibit 1, which is your curriculum vitae.
15 **A. Okay.**
16 Q. Is this the most-up-to-date CV available?
17 **A. It was when I submitted it, yes.**
18 Q. So back in June?
19 **A. I -- I don't recall when I actually**
20 **submitted it.**
21 Q. Okay. Well your expert report is dated June
22 1st, so would that be when you submitted this CV?
23 **A. I think I may have as part of the report,**
24 **yes. Yes.**
25 Q. Well have you consulted with anyone that's

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1 not on the list that you would add to the CV?
 2 **A. Certainly not since '87, no.**
 3 Q. Okay. Under your honors and awards you put
 4 down "Minnesota Supercomputer Institute, Associate
 5 Fellow 1994."
 6 **A. Yes.**
 7 Q. Is there any other supercomputers in
 8 Minnesota besides the one at the University of
 9 Minnesota that you're aware of?
 10 **A. That's the only one I'm aware of.**
 11 Q. Does St. Thomas have a supercomputer?
 12 **A. I do not --**
 13 **I'm not aware of that, no.**
 14 Q. Okay. And you have listed here patents, you
 15 have three patents on page two. Have those all been
 16 assigned to the University of Minnesota?
 17 **A. The first one was in -- let's see. First**
 18 **one was actually developed when I was at Iowa State**
 19 **University.**
 20 Q. Okay. So that was assigned to Iowa State?
 21 **A. That was assigned to Iowa State. The others**
 22 **are the University of Minnesota.**
 23 Q. Okay. Now you don't hold yourself out as an
 24 expert in internal medicine; do you?
 25 **A. That's correct, I do not.**

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1 Q. You don't hold yourself out as an expert
 2 with -- with respect to medical device warnings;
 3 correct?
 4 **A. That's correct.**
 5 Q. You don't hold yourself out as an expert in
 6 anesthesiology; correct?
 7 **A. That's correct.**
 8 Q. You don't hold yourself out as an expert in
 9 patient warming devices; correct?
 10 **A. Other than this, the work I've done here,**
 11 **I've -- I've not done any other work in other patient**
 12 **warming devices.**
 13 Q. Do you know what other patient warming
 14 devices are out there in the market?
 15 **A. You, I think, alluded to some earlier today,**
 16 **but I -- I cannot repeat their names.**
 17 Q. Have you heard of the Mistral?
 18 **A. Yes.**
 19 Q. Have you heard of Warmtouch?
 20 **A. Yes.**
 21 Q. Have you heard of the Hot Dog?
 22 **A. Yes.**
 23 Q. Have you heard of VitaHEAT?
 24 **A. I am not --**
 25 Q. A 3M product.

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1 Q. And you don't hold yourself out as an expert
 2 in infectious diseases; correct?
 3 **A. That's true.**
 4 Q. Sitting here today, you have no opinion of
 5 how many CFUs would cause a periprosthetic joint
 6 infection; correct?
 7 **A. I'm not an expert in that area, so yes, I**
 8 **have no opinion on that.**
 9 Q. Do you know the difference between a
 10 periprosthetic joint infection and a superficial wound
 11 infection?
 12 **A. I do not.**
 13 Q. Okay. You don't hold yourself out as an
 14 expert in orthopedics; correct?
 15 **A. That's -- that's true, I'm not an**
 16 **orthopedics expert.**
 17 Q. You don't hold yourself out as an expert
 18 in -- in nursing; correct?
 19 **A. That's correct.**
 20 Q. You don't hold yourself out as an expert in
 21 the manufacturing of filters; correct?
 22 **A. Manufacturing, that's probably correct.**
 23 Q. Okay. You don't hold yourself out as an
 24 expert in medical device design; correct?
 25 **A. That's correct.**

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1 **A. I'm not -- not sure I have.**
 2 Q. Okay. You're not an expert in operating
 3 room design; are you?
 4 **A. No.**
 5 Q. And you agree that an operating room is
 6 different than other areas in the hospital; correct?
 7 **A. Yes.**
 8 Q. It's not the same as a PACU; correct?
 9 **A. Same as -- come again.**
 10 Q. It's not the same as a PACU.
 11 Do you know what a PACU is?
 12 **A. Will you spell it out?**
 13 Q. Post Anesthesia Care Unit.
 14 **A. Oh. Yes, it's different, yes.**
 15 Q. It's different than an ER -- ER triage
 16 center; correct?
 17 **A. Yes.**
 18 Q. Do you agree that ASHRAE has different
 19 standards for air exchanges in different types of a
 20 hospital?
 21 **A. Yes.**
 22 Q. Like the OR requires a different air
 23 exchange than, say, a patient's room.
 24 **A. Right. Patient isolation room or some other**
 25 **room, yes.**

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- 1 Q. Or regular patient room like a --
- 2 **A. Yes.**
- 3 Q. And also the filtration requirements are
- 4 different for an OR than other parts of the hospital;
- 5 correct?
- 6 **A. That's correct.**
- 7 Q. Okay. Because when you determine filtration
- 8 for a certain room, you have to determine the
- 9 environment of use of that room; correct?
- 10 **A. That's correct.**
- 11 Q. In an operation --
- 12 In an operating room, a -- a person's very
- 13 susceptible to infection because he at that time is
- 14 immunosuppressed because he basically has a wound
- 15 that's open to the air; correct?
- 16 MR. GOSS: Object to form.
- 17 **A. I'm not aware of the details of that.**
- 18 Q. Well you agree with me that you want an
- 19 operating room to be clean as possible to prevent
- 20 infections of open wounds; correct?
- 21 **A. Yes.**
- 22 Q. And you don't hold yourself out as an expert
- 23 in operating room airflow; correct?
- 24 **A. That's correct.**
- 25 Q. Do you know the difference between laminar

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- 1 flow and turbulent flow?
- 2 **A. Yes.**
- 3 Q. Do you hold yourself out as an expert
- 4 between laminar flow and turbulent flow with respect
- 5 to an operating room?
- 6 **A. As applied to an operating room, probably**
- 7 **not.**
- 8 Q. Okay. Do you know whether or not you could
- 9 get true laminar flow in an operating room?
- 10 **A. I would suspect that would be highly**
- 11 **unlikely.**
- 12 Q. You don't hold yourself out as an expert in
- 13 particle flow in an operating room; correct?
- 14 **A. Not that I've worked in. I've never**
- 15 **measured particle flows in an operating room, so I do**
- 16 **not consider myself to be an expert.**
- 17 Q. Are you able to calculate how turbulent flow
- 18 affects particle movement in an operating room?
- 19 **A. I -- I know how to do that in -- in general.**
- 20 **I would assume it would be applied to airflow in an**
- 21 **operating room also.**
- 22 Q. Can you do that by hand, or do you need to
- 23 use the Navier-Stokes equation?
- 24 THE REPORTER: "...do you need to use" --
- 25 Q. Can you do that by hand, or do you need to

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- 1 use some sort of computational modeling?
- 2 **A. For realistic applications that are fairly**
- 3 **complex, you would need to use some software.**
- 4 Q. Okay. Such as ANSYS?
- 5 **A. Yes.**
- 6 Q. Okay. And have you ever used ANSYS or any
- 7 type of computer program to determine how particles
- 8 move in a turbulent environment?
- 9 **A. Yes.**
- 10 Q. When?
- 11 **A. I gave a short course for the American**
- 12 **Association of Aerosol Research probably 20 years ago**
- 13 **which included stochastic particle modeling, effect of**
- 14 **turbulence, turbulent kinetic energy, and basically**
- 15 **using Lagrange in particle tracking.**
- 16 Q. And you agree with me that you have to use
- 17 Lagrange in particle tracking to actually track
- 18 particles in a turbulent environment; correct?
- 19 **A. It turns out that if your particles are**
- 20 **small enough and the airflow does not change direction**
- 21 **very quickly, you could actually use a streamline, the**
- 22 **time-average streamlines, and predict the most**
- 23 **probable particle trajectory in a turbulent**
- 24 **environment.**
- 25 Q. And when you say "small enough," usually one

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- 1 micron or less; correct?
- 2 **A. Yes.**
- 3 Q. Anything larger than one micron actually has
- 4 inertia; correct?
- 5 **A. As I said, it depends on the -- the**
- 6 **direction-of-flow change. If there's no significant**
- 7 **acceleration or direction-of-flow change, then you can**
- 8 **actually use larger particles.**
- 9 Q. Well how large?
- 10 **A. Again, depends on the -- the direction-of-**
- 11 **flow change.**
- 12 Q. But you agree with me that even in a filter,
- 13 that particles larger than one micron do not follow
- 14 the -- the -- the airflow stream; correct?
- 15 **A. Because of the -- the sharp transition of**
- 16 **air -- air streamlines around the fibers of the filter**
- 17 **material.**
- 18 Q. And that's when you -- you -- you collect
- 19 particles by impaction during -- for larger particles;
- 20 correct?
- 21 **A. That's correct.**
- 22 Q. Because larger particles have inertia;
- 23 correct?
- 24 **A. Yes.**
- 25 Q. If there's a -- if there's a change in the

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1 direction of the air stream, it's no longer going to
2 follow -- the particle is no longer going to follow
3 the air stream, it has inertia and will get away from
4 the air stream; correct?

5 **A. And it depends on the ratio of the particle**
6 **inertia and the -- the acceleration.**

7 **Q. And in fact, when you add turbulence to the**
8 **equation, that also affects the airflow when the**
9 **intensity of the turbulence increases; correct? Or**
10 **particle movement.**

11 **A. Yes, it definitely affects particle**
12 **movement.**

13 **Q. Okay. You could have a general air stream,**
14 **but once you add turbulence to that air stream, you**
15 **really can't use the -- the mean average with respect**
16 **to particle movement any more because you have**
17 **turbulence.**

18 **A. That would still be the most probable**
19 **particle path. The turbulence dispersion would be**
20 **about that streamline.**

21 **Q. Okay. Do you have any articles to support**
22 **that opinion?**

23 **A. I'm -- I'm trying to think if -- if we**
24 **published something like that back in the early 1990s,**
25 **and I -- I'd have to go back and look at my**

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1 **Q. Do you agree that Elghabashi is an expert in**
2 **particle movement?**

3 **A. I would say he probably is, yes.**

4 **Q. Are you aware that --**

5 You also looked at his deposition, correct,
6 Dr. Elghabashi's deposition?

7 **A. I -- I was given his deposition. I did not**
8 **have a chance to read through it.**

9 **Q. Are you aware that he's doing work for the**
10 **military with aircraft-carrier design?**

11 **A. I was not aware of that.**

12 **Q. Okay. Are you aware that he has access to**
13 **the military supercomputer that most people don't have**
14 **access to?**

15 **A. I was not aware of that.**

16 **Q. Are you aware of the military supercomputer**
17 **that the military uses for aviation?**

18 **A. Not specifically, no.**

19 **Q. Are you familiar with the Navier-Stokes**
20 **equation?**

21 (Discussion off the stenographic record.)

22 **A. Yes.**

23 **Q. If I asked you to write the equation out,**
24 **could you do that today?**

25 **A. I could probably give it a good -- good**

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1 **publication record.**

2 **Q. And there has been a lot of advancement in**
3 **computational fluid dynamics software since the 1990s;**
4 **hasn't there?**

5 **A. Yes.**

6 **Q. More-powerful computers; correct?**

7 **A. Yes.**

8 **Q. The technical limitation is actually the**
9 **computer.**

10 **A. That's probably correct.**

11 **Q. Might be other limitations, but the most**
12 **significant limitation in performing these**
13 **calculations are the ability of computers to actually**
14 **compute all the data.**

15 **A. It's -- it's the refinement of the grid**
16 **essentially.**

17 **Q. When is the last time you constructed a grid**
18 **for a CFD analysis?**

19 **A. Personally?**

20 **Q. Yes.**

21 **A. Probably -- it's been probably about 20**
22 **years ago.**

23 **Q. You've read Elghabashi's expert report;**
24 **correct?**

25 **A. I have.**

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1 **shot.**

2 **Q. So the answer to that would be maybe, but**
3 **not -- you're not a hundred percent sure you could do**
4 **it.**

5 **A. I -- I'm probably 90 percent sure I could do**
6 **it.**

7 **Q. Could you write out the boussinesq approach**
8 **with -- incorporating that into the Navier-Stokes**
9 **equation today?**

10 **A. I could probably do that.**

11 **Q. Have you reviewed the videos of Dr.**
12 **Elghabashi regarding his CFD analysis?**

13 **A. The videos, no.**

14 **Q. Did you ever consider doing your**
15 **measurements with a PIV?**

16 **A. Which -- which measurements?**

17 **Q. The measurements you did for Exhibit B with**
18 **a --**

19 Do you know what a PIV is?

20 **A. Yes.**

21 **Q. What's a PIV?**

22 **A. Particle Image Velocimetry.**

23 **Q. And that's the most accurate way to measure**
24 **velocity of the air today; correct?**

25 **A. It's a non-intrusive method. It's also a**

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1 very expensive piece of equipment and requires a lot
2 of data -- data analysis.
3 Q. Did you consider using that in your
4 analysis?
5 A. No, because of the --
6 I wasn't sure I had avail -- that type of
7 instrumentation available to me and how much effort it
8 would require to set it up and -- and reduce the data.
9 Q. And it's very expensive.
10 A. And it's very expensive, yes.
11 Q. Could be in -- in -- in the millions.
12 A. I don't think it's quite that much, but
13 certainly hundreds of thousands.
14 Q. Okay. Did you ever consider using ANSYS to
15 model the Bair Hugger in an operating room?
16 A. I did not really consider that. I really
17 have not done CFD work myself for -- for many years.
18 Q. But you consider yourself an expert in CFD.
19 A. I -- I know the protocol, the limitations,
20 yes.
21 Q. What are the limitations?
22 A. Limitations are associated with time steps,
23 with grid resolution, with the turbulent model that
24 you use if you're using a turbulent model, surface
25 conditions, any thermal bouyancy involved. And of

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1 course particle modeling adds another way of
2 complexity.
3 Q. Do you think you're capable sitting here
4 today to perform a CFD analysis, without anyone else's
5 help, on an operating room?
6 A. It would take me quite a while to go back
7 and review the manual and get up -- up to speed. I
8 could probably do it, but it would take me quite a
9 while.
10 Q. So you'll agree with me that with respect to
11 computational fluid dynamics in the present, you're
12 not an expert in it as of right now.
13 A. In terms of actually personally performing
14 the results, --
15 Q. Yes.
16 A. -- no.
17 Q. So you'll agree that you're not an expert at
18 this point in time in your career.
19 A. In terms of analyzing other people's
20 results, I think I am. In terms of generating my own
21 results, no.
22 Q. Do you know the difference between a RANS
23 model and an LES model? R-A-N-S and L-E-S.
24 A. It's been a long time since I've thought
25 about that, but it's Reynolds Averaging Navier-Stokes

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1 versus Large Eddy Simulation.
2 Q. When you performed CFD analysis, did you
3 ever use LES?
4 A. I did not personally. It was the Reynolds
5 Averaging.
6 Q. Okay. And -- and the purpose of the
7 boussinesq and the RANS is to reduce the computational
8 time when you use computational fluid dynamics;
9 correct?
10 A. That's correct, using a simplified set of
11 equations.
12 Q. Okay. When was the first time you saw a
13 Bair Hugger?
14 A. Probably in the -- the office, maybe in
15 March or April.
16 Q. Okay. And which Bair Hugger model was it?
17 A. I believe it was the -- we may have looked
18 at both the 505 and the 750 or 755, or --
19 There was an earlier version and at least
20 one of the later versions.
21 Q. Okay. Going -- going back, and I might have
22 asked you this before, you haven't seen Abraham's
23 report; correct?
24 A. I have not, yes.
25 Q. Okay. So you haven't seen whether or not he

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1 used R -- RANS or LES or the type of turbulent
2 modeling.
3 A. Having not seen his report, I have no idea.
4 Q. Would you agree that when you -- when you
5 model an operating room and you have people in it as
6 well as lights and the flow is not turbulent -- or the
7 flow is turbulent, that you should have some sort of
8 turbulent modeling in your CFD analysis?
9 A. It depends what your ultimate objective is.
10 Q. To follow particles.
11 A. As I said before, if the streamlines had not
12 changed direction very rapidly and the particles are
13 small enough, they would simply follow the time-
14 average streamline without using a turbulence model.
15 Q. Okay. When you say they're not -- they
16 don't change direction very rapidly, what would that
17 mean? What does that mean to you?
18 A. I -- I go back to impactor technology where
19 you're purposely trying to extract particles from the
20 airflow by changing the direction very rapidly, and so
21 it depends on the velocity of the particle and -- and
22 the -- well basically the velocity of the particle
23 heading towards the surface, so impaction technology.
24 Q. Are you saying the change of airflow like 90
25 degrees, or are you saying five degrees, three

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1 degrees?
 2 A. It -- it --
 3 Really, it depends on the rate of change of
 4 airflow, the -- the acceleration I would -- I should
 5 say, perpendicular to the mean flow direction.
 6 Q. And in analyzing --
 7 And in determining whether or not to use a
 8 turbulent model in the CFD, how do you determine
 9 whether or not you should assume that the particles
 10 travel along the air streams or not?
 11 A. Again, depends on whether your flow is
 12 essentially unidirectional or there's a lot of
 13 accelerations associated with it, and -- and the
 14 directional changes.
 15 Q. Well you agree with me that when you have
 16 obstructions such as the patient, surgeon, table,
 17 lights, you're going to have significant changes in
 18 the airflow direction when the air hits that; correct?
 19 A. Yes.
 20 Q. Okay. Knowing what an operating room is, do
 21 you agree with me that you should have some sort of
 22 turbulence modeling in an operating room if you're
 23 going to have a -- a valid CFD analysis?
 24 MR. GOSS: Objection.
 25 A. I think that would be the most appropriate,

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1 A. I -- I have no knowledge of that.
 2 Q. Okay. So you, sitting here today, you have
 3 no opinion on whether or not there's any -- whether or
 4 not the Bair Hugger hose harbors contaminants or
 5 bacteria.
 6 A. I would say it probably does.
 7 Q. Okay. Do you understand the plaintiffs'
 8 claims in this case?
 9 A. Not -- not without hearing them again very
 10 explicitly.
 11 Q. What's your understanding of the mechanism
 12 of injury the plaintiffs claim in this case?
 13 A. I think the plaintiffs are claiming that the
 14 Bair Hugger increases surgical-site infections.
 15 Q. In what way?
 16 A. By providing --
 17 Could be disturbing airflow near the
 18 surgical site, it could be providing additional
 19 particles into the surgical site.
 20 Q. And how would those particles get to the
 21 surgical site?
 22 A. If they're airborne, they have to be
 23 convected there.
 24 Q. Excuse me?
 25 A. If they're airborne, they'd have to be

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1 but I wouldn't necessarily start there.
 2 Q. Well it would be the better approach.
 3 A. Actually, I would start with the first
 4 approach of a time-averaged laminar-flow approach and
 5 then do analysis on that and then see what would need
 6 to be changed to -- If you -- If one would -- If one
 7 needs to go to a turbulent approach.
 8 Q. Why would you use a laminar-flow approach
 9 when you -- when we just discussed that most likely
 10 the air in an operating room is not laminar?
 11 A. It's -- it's a much easier, straightforward,
 12 simpler code to run.
 13 Q. But it's not accurate.
 14 A. It's not as completely accurate as -- as a
 15 fully turbulent model, that's correct, but it's a good
 16 starting point.
 17 Q. When you first saw a Bair Hugger, did you
 18 take it apart?
 19 A. The first time, no, I don't think I did.
 20 Q. Well did you ever take apart the Bair Hugger
 21 and look at the internal components?
 22 A. The only thing I've taken apart is the --
 23 the filter in the -- the bottom.
 24 Q. Do you believe that the Bair Hugger is a
 25 sterile device internally?

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1 convected there.
 2 Q. By conduction?
 3 A. By convection.
 4 Q. And do you know what pathway the par -- the
 5 plaintiffs allege that particles get to the surgical
 6 site when the Bair Hugger is on?
 7 A. Not specifically, no.
 8 Q. Okay. Did you make any assumption in -- in
 9 formulating your test or testing?
 10 A. Assumptions of what the plaintiffs'
 11 arguments are?
 12 Q. Yes.
 13 A. None other than -- than maintaining as -- as
 14 clean a wound area as possible.
 15 Q. You agree with me that the Bair Hugger
 16 produces more watts of energy than any other device in
 17 the operating room; correct?
 18 MR. GOSS: Objection, lacks foundation.
 19 A. I -- I'm not aware of what other equipment
 20 would -- what -- what the heat loads of other
 21 equipment in the operating room would be.
 22 Q. On page 11 of your report you indicate, "As
 23 the Bair Hugger uses the power to provide heat, it may
 24 be the most energy intensive piece of equipment in the
 25 OR."

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1 **A. That's what I said, yes.**
 2 Q. So you agree with me that --
 3 Well do you mean "the most intensive energy
 4 piece," like it absorbs the most en -- uses the most
 5 energy?
 6 **A. Uses the most energy, yes.**
 7 Q. Okay. To create heat, which is energy;
 8 correct?
 9 **A. Yes.**
 10 Q. Okay. Are you aware of any other device in
 11 the OR that produces more watts of heat around the
 12 patient than the Bair Hugger?
 13 **A. No, I'm not aware of that.**
 14 Q. When the Bair Hugger exits the blanket, did
 15 you determine where most of the heat goes?
 16 **A. When the Bair Hugger exits the blanket?**
 17 Q. When the heat -- I'm sorry. When the heat
 18 of the --
 19 When the Bair Hugger blows and heat exits
 20 the blanket, you know, the Bair Hugger blanket --
 21 **A. Yes.**
 22 Q. Okay. By the way, do you know what type of
 23 blanket you used in your testing?
 24 **A. It was an over -- over-body blanket.**
 25 Q. Was it the 522?

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1 **A. I don't remember the exact number.**
 2 Q. Okay. Did you inspect the blanket or study
 3 the blanket in any way?
 4 **A. It was installed before I arrived. I looked**
 5 **at the entire installation.**
 6 Q. Who installed it?
 7 **A. Two nurses.**
 8 Q. What nurses?
 9 **A. I was told nurses from 3M.**
 10 Q. 3M has in-house nurses?
 11 **A. That was what I was led -- led to believe.**
 12 Q. So sitting here today, you don't know how
 13 the setup was -- what was under the drapes?
 14 **A. I didn't remove the -- the drape to look**
 15 **underneath, no.**
 16 Q. Have you seen the -- have you seen the Bair
 17 Hugger upperbody blanket by itself?
 18 **A. Yes.**
 19 Q. And did you look at how many perforations
 20 occur or how many are on the blanket?
 21 **A. A lot of them.**
 22 Q. How many?
 23 **A. I -- I couldn't hazard --**
 24 **I don't want to hazard a guess. It's a lot**
 25 **of holes.**

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1 Q. Over 10?
 2 **A. Oh, yes.**
 3 Q. Over a hundred?
 4 **A. Probably.**
 5 Q. Over a thousand?
 6 **A. Maybe.**
 7 Q. Okay. When the Bair Hugger --
 8 Do you know what position the patient was in
 9 when you did your testing?
 10 **A. It was set up to be a -- a hip surgery.**
 11 Q. Okay. So the patient was to the side.
 12 **A. Yes.**
 13 Q. Okay. And how was the Bair Hugger blanket
 14 on the patient?
 15 **A. It was wrapped around his upper body so his**
 16 **head was protruding at -- at one end, and a blanket**
 17 **over the whole thing, and then there was an anesthesia**
 18 **drape over that.**
 19 Q. Okay. And how far did the drape go down?
 20 **A. The photographs in my report would -- would**
 21 **show that.**
 22 Q. Are all the photographs taken are in your
 23 report?
 24 **A. I believe so, yeah.**
 25 Q. So there are no other photographs that you

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1 took.
 2 **A. No.**
 3 Q. Okay. Who took the photographs, you or Mr.
 4 Goss?
 5 **A. It was either Peter or Vinita.**
 6 Q. Is that Vinita right there?
 7 **A. Yes.**
 8 Q. Okay. So you go to 3M, okay, to do this
 9 testing, and when you get there it's already set up,
 10 correct?
 11 **A. That's correct.**
 12 Q. Okay. And where in 3M was this testing,
 13 what room?
 14 **A. It was in a lab room. I don't remember the**
 15 **exact room number or building number.**
 16 Q. Was it a simulated operating room?
 17 **A. No, it was not an operating room.**
 18 Q. Okay. How big was the room?
 19 **A. It was roughly maybe 12 feet wide by maybe**
 20 **15 feet deep with maybe a nine-foot ceiling.**
 21 Q. Okay. And how many doors to this room?
 22 **A. Just one.**
 23 Q. Okay. And so you get there and it's already
 24 set up; correct?
 25 **A. Yes.**

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1 Q. So you don't -- you don't know in what
2 position the -- the blanket is in, the -- the Bair
3 Hugger blanket; correct?
4 **A. Other than looking at the edges that are**
5 **sticking out from the blanket above.**
6 Q. Okay. Was it laid all the way across the
7 patient?
8 The patient wasn't like in the crucifix
9 position; was he?
10 **A. No. No.**
11 Q. Okay.
12 **A. Laying --**
13 Q. Patient was to the side; correct?
14 **A. Yeah. Yeah.**
15 Q. Was the blanket -- was the blanket wrapped
16 around like in a -- in a -- circular over the patient,
17 was it only over -- was only half the blanket over the
18 patient, do you know?
19 **A. It was over the entire upper body of the**
20 **mannequin and then it draped down somewhat on both**
21 **sides.**
22 Q. Well if the patient's to the side like this,
23 was there part of the blanket that didn't cover the
24 patient, if you know?
25 **A. I'd have to go back to the photos to look.**

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1 Q. Feel free.
2 **A. Okay. I guess the first and last photos**
3 **show the majority of the blanket setup.**
4 Q. I don't see the Bair Hugger in any of these
5 blankets. Can you tell me how you can look at
6 photos -- the first page and the last page of
7 pictures --
8 Well, the last page is a picture of the Bair
9 Hugger on a -- on a -- on a stand. Are you talking
10 about the second-to-last picture?
11 **A. I think it was second-to-the-last, yes.**
12 Q. Okay. So it's clear from the -- the picture
13 that is entitled "3 Inches Over Hip," you can't see
14 the Bair Hugger blanket in this picture; correct?
15 **A. Probably not.**
16 Q. Well "yes" or "no?"
17 **A. I -- I -- I cannot see it, no.**
18 Q. Okay. So you can't see the blanket in this
19 picture; correct?
20 **A. Except perhaps maybe over my hand. That may**
21 **be part of the blanket coming down on one side.**
22 Q. You think the Bair Hugger blanket is coming
23 over your hand?
24 **A. Behind, behind my hand. If you look at the**
25 **top of my hand and -- and what's behind my hand, that**

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1 **appears to be part of the blanket coming down on one**
2 **side.**
3 Q. Can you circle that for me on that report
4 where you see the Bair Hugger blanket.
5 MR. GOSS: I think you're looking at
6 different pictures.
7 MR. ASSAAD: I'm looking at the one that
8 says "3 Inches Over Hip."
9 MR. GOSS: Yeah.
10 THE WITNESS: Yeah. And I'm --
11 MR. GOSS: So he --
12 MR. ASSAAD: Wait, wait, wait. I don't want
13 any instruction here. I don't want any coaching.
14 **A. I'm referring to this.**
15 Q. Okay. I'm talking about the one that says
16 "3 Inches Over Hip," the second-to-last picture of
17 Exhibit B. That picture right there. You just passed
18 it. See where it says "3 Inches Over Hip?"
19 **A. Yeah.**
20 Q. Do you agree that you can't see the Bair
21 Hugger blanket in this picture?
22 **A. I agree with that.**
23 Q. Okay. Wanted to make sure.
24 So you're looking at the first page where it
25 says "3 inches from blanket edge."

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1 **A. Yes.**
2 Q. Okay. And where do you see the Bair Hugger
3 blanket?
4 **A. Just to the --**
5 **I'll circle it here.**
6 Q. Circle it, please.
7 **A. (Complying.) Okay.**
8 Q. Can I see Exhibit 1, please?
9 (Exhibit 1 handed to Mr. Assaad.)
10 Q. Okay. Fair enough. And I -- I see what
11 you're -- you're pointing to.
12 Now you can't see how this blanket is set up
13 underneath, what part of the body it's covering;
14 correct?
15 **A. Not except for where it's extending out**
16 **under the blanket.**
17 Q. Do you know whether or not the Bair Hugger
18 blanket was taped down to the patient?
19 **A. I assume it was.**
20 Q. I'm not asking you to assume anything. I
21 don't want any guesses.
22 **Sitting here today, do you know whether or**
23 **not it was taped down or not?**
24 **A. I did not investigate that, no.**
25 Q. Okay. I mean this is your experiment;

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<p style="text-align: right;">Page 217</p> <p>1 correct?</p> <p>2 A. Yes.</p> <p>3 Q. You're the doc --</p> <p>4 You're the engineer; correct?</p> <p>5 A. Right.</p> <p>6 Q. You're in charge. You got to make sure that</p> <p>7 everything is done properly because you're relying on</p> <p>8 the setup to conduct your testing; correct?</p> <p>9 A. That's correct.</p> <p>10 Q. You did not check to see whether or not the</p> <p>11 Bair Hugger blanket was taped; did you?</p> <p>12 A. I did not.</p> <p>13 Q. Okay. So sitting here, focused, you cannot</p> <p>14 tell me whether or not air is escaping downward of the</p> <p>15 body as compared to coming out of, like, the head or</p> <p>16 the arms; correct?</p> <p>17 MR. GOSS: Object to form.</p> <p>18 A. Not having checked the taping, that -- I</p> <p>19 cannot guarantee that.</p> <p>20 Q. Do you know whether or not the taping</p> <p>21 actually sticks well to a mannequin?</p> <p>22 A. I -- I do not know that.</p> <p>23 Q. That would be something important to know;</p> <p>24 wouldn't it?</p> <p>25 A. It would be useful, yes.</p>	<p style="text-align: right;">Page 219</p> <p>1 temperature of the air coming out of the -- out of the</p> <p>2 holes, correct, the perforations?</p> <p>3 A. That's correct, I did not do that.</p> <p>4 Q. Okay. Would you agree with me that the air</p> <p>5 coming out of the perforations is roughly 40 to 41</p> <p>6 degrees Celsius?</p> <p>7 A. That sounds much higher than what I was</p> <p>8 measuring right near the discharge of the air coming</p> <p>9 out the edge of the blanket.</p> <p>10 Q. Well let's talk about heat transfer for a</p> <p>11 second.</p> <p>12 By the way, what's the first law of</p> <p>13 thermodynamics?</p> <p>14 A. First law of thermodynamics is conservation</p> <p>15 of energy.</p> <p>16 Q. Energy is neither created or destroyed;</p> <p>17 correct?</p> <p>18 A. Yes.</p> <p>19 Q. Heat transfer is a transfer of heat from a</p> <p>20 higher heat content to a lower heat content; correct?</p> <p>21 A. Higher temperature to a lower temperature.</p> <p>22 Q. Yes. You're not going to transfer heat from</p> <p>23 a -- you know, from a lower temperature to a higher</p> <p>24 temperature. Heat transfer goes from highest to</p> <p>25 lowest; correct?</p>
<p style="text-align: right;">Page 218</p> <p>1 Q. Yeah. Because you might actually have</p> <p>2 leakage of air going where it doesn't happily --</p> <p>3 doesn't normally go during normal operation; correct?</p> <p>4 MR. GOSS: Objection, form.</p> <p>5 A. It's possible.</p> <p>6 Q. And it could affect your results; correct?</p> <p>7 MR. GOSS: Same objection.</p> <p>8 A. Potentially.</p> <p>9 Q. Did you talk to these nurses at all that set</p> <p>10 up the operating room?</p> <p>11 A. I did not.</p> <p>12 Q. Okay. So sitting here today, you don't even</p> <p>13 know their names; do you?</p> <p>14 A. I do not know their names.</p> <p>15 Q. Did you write their names down anywhere on</p> <p>16 your -- on your pad?</p> <p>17 A. No, because I do not know their names.</p> <p>18 Q. You relied on 3M to do the setup; correct?</p> <p>19 A. Yes.</p> <p>20 Q. Okay. The same -- the same attorneys that</p> <p>21 provided you the plethora of information that's out</p> <p>22 there; correct?</p> <p>23 MR. GOSS: Objection, argumentative, asked</p> <p>24 and answered.</p> <p>25 Q. And I assume you never measured the</p>	<p style="text-align: right;">Page 220</p> <p>1 A. Yes.</p> <p>2 Q. That -- that's a fundamental engineering</p> <p>3 principle; correct?</p> <p>4 A. Yes.</p> <p>5 Q. Okay. What's the temperature of a human</p> <p>6 body?</p> <p>7 A. Skin temp --</p> <p>8 Well core temperature and then there's skin</p> <p>9 temperature.</p> <p>10 Q. Just skin temperature.</p> <p>11 A. Skin temperature really depends on clothing</p> <p>12 and the environment.</p> <p>13 Q. Well what's the core temperature?</p> <p>14 A. Core temperature is averaged around 98.6</p> <p>15 Fahrenheit.</p> <p>16 Q. Which would be what in Celsius? Thirty-six</p> <p>17 and a half?</p> <p>18 A. That sounds reasonable, yes.</p> <p>19 Q. Okay. So you agree with me that to warm a</p> <p>20 patient, the temperature has to be above 36.5 degrees</p> <p>21 Celsius.</p> <p>22 A. Not necessarily, because the skin</p> <p>23 temperature could be much lower than that.</p> <p>24 Q. Well what do you think the skin temperature</p> <p>25 is?</p>

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1 **A. As I said, it depends on -- on clothing**
 2 **and -- and the ambient environment.**
 3 Q. So if 3M has done research and done studies
 4 and indicated the temperature coming out of the Bair
 5 Hugger blanket is between 40 to 41 degrees Celsius
 6 when a Bair Hugger 775 is used on a 522 blanket, would
 7 you disagree with that?
 8 **A. Say that again.**
 9 Q. Would you dis -- would you disagree with
 10 3M's own studies that indicates that the temperature
 11 coming out of a Bair Hugger blanket from the
 12 perforations when a 775 blower is used and a 522
 13 blanket is used is between 40 to 41 Celsius, would you
 14 disagree with that?
 15 **A. If that's their measurements, I would not**
 16 **disagree with that.**
 17 Q. Do your measurements reflect that?
 18 **A. My measurements were taken at a different**
 19 **location.**
 20 Q. Okay. So sitting here today, you have no
 21 idea what the temperature out of the blanket -- the
 22 air temperature out of the blanket is.
 23 MR. GOSS: Objection to form.
 24 **A. I -- I do in the locations that I measured.**
 25 Q. I'm talking about right directly out of the

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1 **A. Not necessarily, because if -- if -- unless**
 2 **there was significant leakage between the room and the**
 3 **surrounding areas.**
 4 Q. Well can we assume that there was no
 5 leakage?
 6 **A. That would be a good assumption.**
 7 Q. Okay. What was the temperature of the
 8 walls?
 9 **A. Temperature of the walls were probably near**
 10 **the initial temperature when we started the test,**
 11 **so --**
 12 Q. Sixty-six degrees?
 13 **A. -- probably about 66.**
 14 Q. Okay. What was the temperature of the --
 15 was --
 16 Was it an operating room table that was
 17 used?
 18 **A. I believe so, yes.**
 19 Q. They actually had a real operating table in
 20 this random room at 3M.
 21 MR. GOSS: Objection to form.
 22 **A. Well what -- what do you mean by "real**
 23 **operating table?"**
 24 Q. Did you see the table, or was it covered
 25 with drapes?

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1 blanket. You don't know what that is; do you?
 2 **A. There was a discharge right out of the**
 3 **blanket right near the first figure where I'm**
 4 **measuring the temperature and velocity.**
 5 Q. That's three inches from the blanket edge;
 6 correct?
 7 **A. Yes, I think that's right.**
 8 Q. Okay. And you measured it at, when the Bair
 9 Hugger was off, at 66.2 degrees; correct?
 10 **A. Yes.**
 11 Q. Okay. Now let's talk about this room some
 12 more. Okay? Did the room have ventilation?
 13 **A. Yes.**
 14 Q. What was the ventilation?
 15 **A. It was provided through a ceiling supply and**
 16 **ceiling return.**
 17 Q. Okay. One ceiling supply, one ceiling
 18 return?
 19 **A. It was a -- a slot supply at one end of the**
 20 **room and a slot return at the other.**
 21 Q. Okay. Was it positive pressure or negative
 22 pressure or neutral pressure?
 23 **A. I did not measure that.**
 24 Q. Well wouldn't that be something important to
 25 know?

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1 **A. It was covered with drapes.**
 2 Q. So you don't know what was underneath; do
 3 you?
 4 MR. GOSS: Objection to form.
 5 **A. Not --not really.**
 6 MR. ASSAAD: Basis.
 7 MR. GOSS: Well, it was set up by nurses, so
 8 he's assuming that they set it up in a way they would
 9 have done for a real operation. That's my basis.
 10 MR. ASSAAD: Do you have a legal -- do you
 11 have a legal basis?
 12 MR. GOSS: You're -- you are -- you are
 13 expressing the idea that he knew absolutely nothing.
 14 He's not a nurse. He relied on the nurses to set
 15 everything up and use the proper equipment.
 16 Q. So you relied on --
 17 MR. GOSS: That's my basis.
 18 Q. You relied on nurses; correct?
 19 **A. Yes.**
 20 Q. Nurses you don't know; correct?
 21 **A. Yes.**
 22 Q. Nurses hired by 3M; correct?
 23 **A. Probably, yes.**
 24 Q. They were 3M nurses; correct?
 25 **A. I do not know who they were.**

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1 Q. I mean does 3M have a hospital inside its
2 facility?
3 A. **Not that I'm aware of.**
4 Q. Okay. Do you know if any of the attorneys
5 were involved in the setup?
6 (Discussion off the stenographic record.)
7 A. **I don't think so. I think we met there**
8 **together.**
9 Q. How did you get into the building? Did you
10 meet Mr. Goss and his associate at -- at the front of
11 the building?
12 A. **Yes.**
13 Q. Okay. Do you know whether or not Mr. Goss
14 or his associate was involved in the setup?
15 A. **I do not know that.**
16 Q. You agree that people emit energy that -- or
17 heat in a -- in a room; correct? The heating load.
18 A. **People give off energy, yes.**
19 Q. Okay.
20 A. **Yeah.**
21 Q. That's why people --
22 If the room is really crowded, if you get
23 really warm, you have to turn up the air conditioning;
24 correct?
25 A. **Yes.**

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1 Q. To increase the cooling load; correct?
2 A. **Right.**
3 Q. Okay. Do you agree that the setup that you
4 have here is not similar to what actually occurs in an
5 operating room?
6 A. **I would agree that the room configuration is**
7 **not a typical operating room, yes.**
8 Q. Well you don't have surgical lights;
9 correct?
10 A. **Yes.**
11 Q. You don't have surgeons and -- and an
12 anesthesiologist around the surgical table; correct?
13 A. **Right.**
14 Q. And you agree that's going to affect airflow
15 as well as turbulence as well as heat transfer;
16 correct?
17 A. **Yes.**
18 Q. Okay. Now did the room have its own
19 thermostat?
20 A. **I believe it did.**
21 Q. Well "yes" or "no."
22 A. **Yes.**
23 Q. Okay. Did you change the thermostat at all
24 during the -- during the testing?
25 A. **Yes.**

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1 Q. You did?
2 A. **Yes.**
3 Q. What did you change it from?
4 A. **Increased it, I don't remember the exact**
5 **number, from -- it may have been set something like**
6 **65, maybe up to 70, something like that.**
7 Q. Why did you change it?
8 A. **Just seemed to be extremely cold in there.**
9 Q. Did you change it in the middle of the test
10 or before the testing?
11 A. **Before the testing.**
12 Q. Okay. How much longer before the testing?
13 A. **Maybe a half hour.**
14 Q. Half hour. Okay.
15 So by the 30 minutes, the room should have
16 been at equilibrium; correct?
17 A. **That's a good assumption.**
18 Q. Okay. So if you changed it to 70, okay, why
19 am I seeing results of 66.6 degrees here?
20 A. **It -- it may have just taken -- taken longer**
21 **than I --**
22 Q. You just told me it was at equilibrium.
23 A. **Well may -- maybe it did not reach**
24 **equilibrium yet.**
25 Q. We don't know. We could --

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1 So now we don't know if these numbers are
2 correct; do we?
3 MR. GOSS: Objection to form.
4 A. **The numbers are -- are correct as I measured**
5 **them in the location I measured them.**
6 Q. Well now add another variable. You added --
7 you changed the room temperature.
8 A. **Yes.**
9 Q. You then -- now --
10 You said it was at equilibrium and now
11 you're saying it might not be at equilibrium. Which
12 one is, doctor?
13 MR. GOSS: Wait for a question.
14 Q. Which one is it?
15 A. **May not be in equilibrium.**
16 Q. Okay. So now you have a variable that
17 you're not accounting for in your results; isn't that
18 correct?
19 A. **Yes.**
20 Q. And you call that good engineering?
21 MR. GOSS: Objection to form, argumentative.
22 A. **If I had more time to develop a better test**
23 **method, I would probably take that into consideration.**
24 Q. Well are you saying this is not a good test
25 method?

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1 **A. It -- it was set up to do some temperature**
 2 **and flow measurements leaving the Bair Hugger blanket,**
 3 **primarily, and entering the Bair Hugger filter.**
 4 Q. That wasn't my question. Is this a good
 5 test method, "yes" or "no?"
 6 **A. Yes.**
 7 Q. Okay. So you have an operating room that's
 8 not at --
 9 You have a room that's not at equilibrium;
 10 correct?
 11 **A. Yes.**
 12 Q. You don't know how the Bair Hugger is set up
 13 underneath the blanket; correct?
 14 **A. Yes.**
 15 Q. Okay. You have --
 16 You changed the temperature at some point
 17 because you were cold; correct?
 18 **A. Yes.**
 19 MR. GOSS: Objection to form.
 20 Q. Okay.
 21 MR. ASSAAD: Basis.
 22 MR. GOSS: He didn't say because he was
 23 cold.
 24 Q. Why did you change the temperature then?
 25 **A. I'm not sure I actually feel like I did**

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1 What's that volume?
 2 **A. I'd -- I'd have to calculate it.**
 3 Q. Are you sure about those numbers?
 4 **A. I'm not absolutely certain.**
 5 Q. Wouldn't that be important to know?
 6 **A. If I was looking at air-change rate, yes.**
 7 Q. So you're looking at about 10,000 cubic
 8 feet. Does that sound about right?
 9 **A. That's probably about right.**
 10 Q. Eleven thousand.
 11 Do you stand by these numbers, doctor, in
 12 Exhibit B? Are they accurate? Are they reliable?
 13 **A. Based on the test configuration we had or**
 14 **the conditions, yes.**
 15 Q. Well doctor, let's go to page -- the one
 16 that says "3 Inches Over Hip."
 17 Well before we get to that, let's go to the
 18 last page of Exhibit B. That's the calibration by TSI
 19 of the device; correct?
 20 **A. The very last page, yes.**
 21 Q. Okay. And on May 8th, 2017, this device was
 22 calibrated; correct?
 23 **A. That's what it says, yes.**
 24 Q. Okay. And you -- you -- you agree with
 25 this, that the device used was calibrated; correct?

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1 **change the temperature.**
 2 Q. Who did?
 3 **A. May have been one of -- Peter or -- or**
 4 **Vinita.**
 5 Q. I mean we have the law of thermodynamics.
 6 We're not going to break that law; correct?
 7 **A. Right.**
 8 Q. Okay. You have the temperature coming out
 9 at 70 degrees; correct? Seventy-two degrees.
 10 **A. Seventy-two degrees from what?**
 11 Q. It's coming out the diffuser.
 12 **A. It -- it may take a while for the thermostat**
 13 **to --**
 14 **Well, it may take a while for the air to**
 15 **reach the temperature that the thermostat is set at.**
 16 Q. But you have the diffuser air coming out at
 17 72 degrees and you did that 30 -- 30 minutes before
 18 you started taking these tests; correct?
 19 **A. That's what I recall.**
 20 Q. Okay. And the room is only 12 by nine;
 21 correct?
 22 MR. GOSS: Objection.
 23 **A. Roughly 12 by 15 but with a nine-foot**
 24 **ceiling.**
 25 Q. Nine feet high.

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1 **A. Yes.**
 2 Q. Who provided the device?
 3 **A. Device was provided by 3M.**
 4 Q. Okay. So 3M provided the device and 3M
 5 provided the room and 3M provided the setup; correct?
 6 **A. Well that's my understanding.**
 7 Q. Okay. Whose idea was it to do this testing?
 8 **A. I think it was mine.**
 9 Q. Okay. Why didn't you do it at the
 10 University of Minnesota?
 11 **A. I am no longer a faculty member there, I'm**
 12 **retired, so I did not have access to a facility.**
 13 Q. Okay. Let's go to the page that says "3
 14 Inches Over Hip" where it was "Under linear slot
 15 diffuser air supply on ceiling (Front) - half inch
 16 from supply." Do you see that?
 17 **A. Wait a minute.**
 18 Q. It's the pic -- it's -- it's the picture --
 19 **A. Oh.**
 20 Q. You measured the temperature coming out of
 21 the air supply; correct?
 22 **A. Yes.**
 23 Q. And this was done 30 minutes --
 24 You changed the temperature 30 minutes
 25 before you started doing any testing; correct?

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1 **A. That -- that's my recollection.**
 2 **Q. I mean that's an important fact when you're**
 3 **going to start taking temperature measurements, that**
 4 **you actually changed the temperature of the air**
 5 **supply; don't you agree?**
 6 **A. Yes, it would be important to document that.**
 7 **Q. Very important. Is it documented anywhere**
 8 **in your report?**
 9 **A. No.**
 10 **Q. Okay. So we see, depending on where you're**
 11 **measuring, you see anywhere between 330 feet per**
 12 **minute to 1550 feet per minute; correct?**
 13 **A. That's correct.**
 14 **Q. Are those numbers accurate?**
 15 **A. I believe they -- I believe they're**
 16 **accurate.**
 17 **Q. Okay. So you tried --**
 18 **In the same diffuser, you're getting a range**
 19 **of 330 to 1550 feet out of the same duct.**
 20 **A. There are actually three separate diffusers**
 21 **end to end.**
 22 **Q. Okay. So three diffusers. So I should add**
 23 **all these up for the amount of air entering the room;**
 24 **correct?**
 25 **A. That's --**

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1 **Q. Sounds good since that is --**
 2 **A. That's not going to be volumetric flow rate.**
 3 **MR. GOSS: Just let him finish, please. Let**
 4 **him finish.**
 5 **Q. Huh?**
 6 **A. That's not volumetric flow rate. Those are**
 7 **just velocity measurements in the center of the**
 8 **diffuser.**
 9 **Q. Okay. So that's the velocity of the air**
 10 **coming in; correct?**
 11 **A. Yes.**
 12 **Q. Do you know what the flow rate is?**
 13 **A. I did not calculate that.**
 14 **Q. Would that be important to know?**
 15 **A. Perhaps.**
 16 **Q. Perhaps or yes?**
 17 **A. Yes.**
 18 **Q. That's a -- that's a pretty high velocity;**
 19 **isn't it?**
 20 **A. It is, yes.**
 21 **Q. Okay. So in a room that small, you would**
 22 **agree that within 30 minutes you should reach**
 23 **equilibrium.**
 24 **A. I'd have to look at the -- the wall**
 25 **structure and the thermal mass in the room, and --**

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1 **and I -- I can't -- I can't speculate at this point.**
 2 **Q. Okay. But that would be important to know;**
 3 **wouldn't it?**
 4 **A. It -- it would.**
 5 **Q. And sitting here today we don't know that;**
 6 **do we?**
 7 **A. We do not.**
 8 **Q. Okay. But what we do know is this, okay,**
 9 **that the air is coming in at 72 degrees, it's been on**
 10 **for 30 minutes, and you're getting temperatures below**
 11 **72 degrees in the -- in the room; correct?**
 12 **A. Yes.**
 13 **Q. Okay. And in fact, according to your**
 14 **calculations, when the Bair Hugger is on, it actually**
 15 **cools the area over the head; correct?**
 16 **MR. GOSS: Objection to form.**
 17 **A. I don't think I have temperature**
 18 **measurements into the inlet of the Bair Hugger and out**
 19 **at the same time, so --**
 20 **Q. Well let's look at this page right here,**
 21 **let's look at three inches over the hip. Bair Hugger**
 22 **off, 70.7 degrees; correct?**
 23 **A. Yes.**
 24 **Q. That's parallel and perpendicular, that's**
 25 **just giving you different flow rates; correct?**

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1 **A. Yes.**
 2 **Q. Okay. And then you turn the -- you turn --**
 3 **you turn the Bair Hugger on and all of a sudden the**
 4 **temperature is 64.9 degrees. Does that make sense?**
 5 **A. That's what it says.**
 6 **Q. Does that make engineering sense?**
 7 **A. Unless there was something going on with**
 8 **temperature fluctuations in the room, I -- I -- I**
 9 **don't know.**
 10 **Q. That does not make sense; does it, doctor?**
 11 **A. Again, I don't know how the HVAC system**
 12 **temperature was controlled.**
 13 **Q. We're talking about a six- -- a five-degree**
 14 **drop, almost six degrees once you turn the Bair Hugger**
 15 **on.**
 16 **Let me back up a second. Doctor, did you do**
 17 **these tests in a continuous fashion or did you go take**
 18 **measurements, then change the thermostat and take**
 19 **measurements with the Bair Hugger on?**
 20 **A. No. The thermostat was changed before we**
 21 **did any of the measurements.**
 22 **Q. Okay. And you took them in continuous**
 23 **fashion. You turned the Bair Hugger --**
 24 **It was off and then you turned it on to see**
 25 **what the change was; correct?**

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1 **A. Yes.**
 2 Q. How long did you wait?
 3 **A. It probably took, I would guess, maybe an**
 4 **hour for the measurements with the Bair Hugger off**
 5 **before we turned it on.**
 6 Q. So you spent an hour with the Bair Hugger
 7 off and then you turned it on.
 8 **A. Yes.**
 9 Q. So you did all the measurements off first
 10 and then all the measurements on later?
 11 **A. I'm -- I'm trying to recollect the -- the**
 12 **sequence of -- of measurements.**
 13 Q. Well I mean part of writing a scientific
 14 report is that someone else could reproduce the
 15 results; correct?
 16 **A. Yes.**
 17 Q. Okay. None of that is in this report;
 18 correct?
 19 **A. Without additional information, that's**
 20 **correct.**
 21 Q. I'm asking you in this report is there
 22 any --
 23 Is there a methodology written out in this
 24 report how this was done?
 25 **A. No, there's no methodology.**

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1 Q. There's no methodology in this report; is
 2 there?
 3 **A. No.**
 4 MR. GOSS: Asked and answered.
 5 Q. So how is it that when you have the first
 6 law of thermodynamics and you turn on a device that
 7 blows 40-degree heat into an operating room -- or into
 8 a room that's only 12 by 15, that you see a reduction
 9 in air temperature? Can you answer that question?
 10 **A. I'm -- I'm trying to recollect the actual**
 11 **sequence of measurements.**
 12 Q. Forget about the sequence. I'm looking at
 13 the data here. This is your data. You say one
 14 minute, two minutes, three minutes, four minutes. How
 15 is adding heat to a room, and you have the first law
 16 of thermodynamics, Engineering 101, --
 17 MR. GOSS: You don't have to yell.
 18 Q. -- and you have to get a reduction in
 19 temperature, could you please answer that question?
 20 MR. GOSS: You don't -- you don't have to
 21 yell at him.
 22 **A. I -- I would have to give that more thought**
 23 **to explain why the --**
 24 Q. Now is your time for an answer. I'm not
 25 coming back another day.

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1 **A. Okay.**
 2 Q. Do you know the answer to that? "Yes" or
 3 "no."
 4 **A. Not at the moment without further thought.**
 5 Q. What further thought? Would it violate the
 6 first law of thermodynamics?
 7 **A. I'd have to think about other aspects of the**
 8 **airflow in the room that may have affected that.**
 9 Q. What other aspects are there? We have the
 10 ventilation that we have accounted for. That's been
 11 constant. Okay? What -- what other aspects?
 12 **A. I am not sure the ventilation rate was**
 13 **constant.**
 14 Q. Well do you know one way or the other?
 15 **A. I do not know.**
 16 Q. Okay. Well if it wasn't constant, that's
 17 going to affect all your results; correct?
 18 **A. I would not think it would affect the**
 19 **results right near the Bair Hugger blanket or right**
 20 **near the inlet to the filter.**
 21 Q. Well it's affecting the area right above the
 22 hip.
 23 **A. That's not near the Bair Hugger blanket**
 24 **discharge or the filter inlet.**
 25 Q. We're measuring above the hip here. We're

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1 seeing a change for no apparent reason when the Bair
 2 Hugger is on to a lower level.
 3 **A. Again --**
 4 Q. What -- what -- what's the second law of
 5 thermodynamics?
 6 **A. Can't destroy entropy.**
 7 Q. Okay. What's entropy?
 8 **A. It's a natural direction of disorder.**
 9 Q. You go from order to disorder; correct?
 10 **A. Yes.**
 11 Q. Such as, in this case, as heat leaves an
 12 area, it's going to dissipate in an orderly fashion;
 13 correct?
 14 **A. That's correct.**
 15 Q. Okay. Entropy applies to this case;
 16 correct?
 17 **A. That should apply to every case.**
 18 Q. And in a room of this confinement, 12 by
 19 15 --
 20 Which is not a large room; correct?
 21 **A. That's not very large, yes.**
 22 Q. Okay. So you have the first law of
 23 thermodynamics and the second law of thermodynamics,
 24 it's going to increase the average temperature in the
 25 room if you turn on the Bair Hugger; correct?

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1 A. Say that again.
 2 Q. The Bair Hugger is going to increase the
 3 temperature of the room. You have another heat source
 4 of -- of -- of a device blowing 40-degree Celsius air
 5 at 43 to 45 cfm. It's going to --
 6 It's a heater, it's a space heater.
 7 A. Yes, it's a heater.
 8 Q. Okay. It's going to affect the temperature
 9 of the room. It's not going to decrease the
 10 temperature; correct?
 11 A. Right.
 12 Q. Okay. But we have a decrease here; correct?
 13 A. That -- that's what it shows.
 14 Q. Okay. You agree that these numbers are not
 15 reliable.
 16 MR. GOSS: Objection to form.
 17 A. I would -- I would argue with not being
 18 reliable. Those -- those are the measurements that we
 19 made at the time.
 20 Q. Part of your job as an engineer is to look
 21 at the reliability of the data you obtain; correct?
 22 A. Yes.
 23 Q. Okay. As a scientist, you have to look at
 24 its reliability; correct?
 25 A. Yes.

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1 Q. You have a project --
 2 And this is where the hypothesis is very
 3 important. Okay? Hypothesis: I have a Bair Hugger
 4 in a room. I turn it on. It's going to increase the
 5 temperature. That would be a correct hypothesis in
 6 that situation; correct?
 7 A. Yes.
 8 Q. Okay. And all of a sudden you turn it on
 9 and you get something against the hypothesis, it
 10 decreases the temperature according to your data;
 11 correct?
 12 MR. GOSS: Objection to form.
 13 A. That -- that's what it appears, yes.
 14 Q. That's the measurements you took; correct?
 15 A. Yes.
 16 Q. Not only does this violate the first and
 17 second laws of thermodynamics, it doesn't make sense;
 18 correct?
 19 A. Can I interject something here?
 20 Q. "Yes" or "no," then you can do that.
 21 MR. GOSS: You can -- you can answer his
 22 question.
 23 A. It -- in --
 24 From a straight heat-transfer standpoint,
 25 no, it does not make sense.

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1 Q. Okay. Therefore it's not reliable.
 2 MR. GOSS: Objection to form.
 3 A. I guess -- I guess one could come to that
 4 conclusion.
 5 Q. Well what do you come to? Do you believe
 6 this data here is reliable with respect to the
 7 measurements on Exhibit B of your Exhibit 1 of your
 8 report, which is three inches over the hip, and when
 9 the Bair Hugger is turned on the temperature above the
 10 hip goes down? Does that make engineering sense?
 11 A. It may not.
 12 Q. You agree with me, doctor, that this is not
 13 reliable data with this set of data points; correct?
 14 MR. GOSS: Objection to form, asked and
 15 answered.
 16 MR. ASSAAD: He hasn't answered the
 17 question.
 18 MR. GOSS: Yeah, I think he has.
 19 A. I'll -- I'll agree with you.
 20 Q. It's not reliable; correct?
 21 MR. GOSS: Objection to form.
 22 A. It -- it's not reproducible probably.
 23 Q. Or reliable; correct?
 24 MR. GOSS: Objection to form.
 25 A. Again, how do you define "reliable?"

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1 Q. Show me an engineering calculation in which
 2 you add a heat source to a room and the -- and the
 3 temperature of the room -- that's the only change in
 4 the room, you add a heat source, okay, above the
 5 ambient temperature, that the temperature actually
 6 goes below ambient. Can you give me a calculation and
 7 engineering principles that could solve that equation?
 8 A. It may have to do with the initial
 9 temperature of the room being -- being low and the
 10 heat being ab -- absorbed by those low-temperature
 11 surfaces.
 12 Q. You turn on the Bair Hugger and the
 13 temperature started going down. The room was
 14 constant. Okay? How does this result occur unless
 15 these are wrong results and therefore not reliable?
 16 MR. GOSS: Objection to form, misstates the
 17 experiment.
 18 MR. ASSAAD: I just want him to answer the
 19 question.
 20 Q. Do we need to go back to engineering ethics
 21 about honesty, integrity, fidelity?
 22 MR. GOSS: Badgering.
 23 Q. It's a simple question, doctor. You know
 24 these -- these are not reliable. Just admit to it.
 25 MR. GOSS: No. Objection to form,

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1 argumentative, badgering.
 2 **A. I -- I stand by the results as -- as**
 3 **obtained.**
 4 Q. I don't care if you stand by them or not. I
 5 want to know if these are reliable. Answer the
 6 question.
 7 MR. GOSS: He answered the question.
 8 MR. ASSAAD: No, he hasn't.
 9 MR. GOSS: You don't have to say anything
 10 further on this. You answered the question.
 11 Q. Then I'm going assume that it's not reliable
 12 according to your testimony. Fair enough?
 13 MR. GOSS: You can assume whatever you want.
 14 He testified that he stands by the results. .
 15 Q. How are these temperatures higher or lower
 16 than the air going into the air return?
 17 **A. I -- I can't answer that. I don't have a**
 18 **good explanation for that.**
 19 Q. Go to the page before that. "Over center of
 20 anesthesia screen, 3 inches above top (Center)." Now
 21 the diffuser's on the ceiling; correct?
 22 **A. That's correct.**
 23 Q. And there's three of them; correct?
 24 **A. Yes.**
 25 Q. Okay. Are they all spread evenly in the

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1 Q. Would that be important to know where to
 2 make measurements?
 3 **A. I was assuming that the blanket was -- was**
 4 **taped as it should be on the lower-body end, and so**
 5 **the air would be coming out near the head and shoulder**
 6 **area.**
 7 Q. Why would you assume it comes out near the
 8 head and shoulder?
 9 **A. Because of the blanket that's put over the**
 10 **Bair Hugger blanket.**
 11 Q. Yeah. But it's also going over the arm;
 12 correct?
 13 **A. Yes. Yes.**
 14 Q. That's not the head and shoulder.
 15 **A. Well I -- I should include that then.**
 16 Q. Okay. So now we got the head and shoulder,
 17 the arm. Do you know where the air escaped? Does it
 18 escape --
 19 Do you know how it's set up in an operating
 20 room?
 21 **A. None other than the way observed here.**
 22 Q. Well doctor, you -- you -- you're here as an
 23 expert to say, hey, look at this report, this is what
 24 happens in an operating room. You agree with me this
 25 is nowhere near what happens in an operating room;

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1 ceiling?
 2 **A. Yes, they're -- they're lined up.**
 3 Q. Okay. Did you take any pictures?
 4 **A. Not of those, no.**
 5 Q. Okay. That would be something important
 6 to -- to have today; wouldn't it?
 7 **A. If this was set up as a simulated OR, yes,**
 8 **but I admit it's not a typical OR setup.**
 9 Q. So you have air coming out at 72 degrees
 10 except you read when the -- when the Bair Hugger is on
 11 but on ambient it's 64.9 degrees. How do you get that
 12 temperature?
 13 Not only is it below the 66 degrees that you
 14 think the room is at or you stated was in the report,
 15 but it's below the 72.
 16 **A. That does strike me as unusual.**
 17 Q. Is that a reliable number?
 18 **A. I would say probably not.**
 19 Q. Okay. Did you determine where most of the
 20 air --
 21 I asked you this before; I don't think I had
 22 an answer. Do you know where most of the air goes
 23 when it comes out of the blanket, where it escapes
 24 from?
 25 **A. I did not determine that.**

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1 correct?
 2 MR. GOSS: Object to the form.
 3 **A. I'm not claiming this is what happens in an**
 4 **actual operating room.**
 5 Q. Okay. What's the longest time you had the
 6 Bair Hugger on? How long did you have the Bair Hugger
 7 on?
 8 **A. Maybe an hour, hour and a half.**
 9 Q. It was on continuously for an hour, hour and
 10 a half.
 11 **A. Yes.**
 12 Q. Where -- where does it say that in the
 13 report?
 14 **A. It doesn't.**
 15 Q. So how do I know that?
 16 MR. GOSS: He just testified to it.
 17 Q. Besides your testimony, how do I know that?
 18 **A. Not other than my testimony.**
 19 Q. At what time -- how long was the Bair Hugger
 20 on when you --
 21 If you go to the "3 Inches Over Hip" where
 22 it says "Off -- par -- Off -- parallel, Off --
 23 perpendicular, On -- parallel, On -- perpendicular, On
 24 -- parallel, parallel, parallel," how long was the
 25 Bair Hugger on before you started taking those

62 (Pages 245 to 248)

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<p style="text-align: right;">Page 249</p> <p>1 measurements?</p> <p>2 A. Where are you? Back on the hip page?</p> <p>3 Q. Uh-huh.</p> <p>4 A. I do not record that information, so I -- I</p> <p>5 do not recall.</p> <p>6 Q. So I -- I -- I mean you don't recall, so</p> <p>7 sitting here today I cannot determine the methodology</p> <p>8 used and reproduce what you did in this case; correct?</p> <p>9 MR. GOSS: Objection to form.</p> <p>10 Q. Because you don't know.</p> <p>11 MR. GOSS: Wait for him to ask a question.</p> <p>12 Q. You don't know, do you, what you did</p> <p>13 sitting here today?</p> <p>14 MR. GOSS: Object to form.</p> <p>15 A. I do, but not some of the details you're</p> <p>16 asking about.</p> <p>17 Q. Well details are important, isn't it?</p> <p>18 A. Yes.</p> <p>19 Q. I mean would you accept a report like this</p> <p>20 from one of your students doing a thesis for a Ph.D.?</p> <p>21 A. Not solely, no.</p> <p>22 Q. I mean you'd expect some sort of methodology</p> <p>23 and some way to determine that the data is reliable;</p> <p>24 correct? Correct?</p> <p>25 A. Yes.</p>	<p style="text-align: right;">Page 251</p> <p>1 MR. GOSS: No.</p> <p>2 MR. ASSAD: Tell your expert to answer the</p> <p>3 question.</p> <p>4 MR. GOSS: No, I'm not going to.</p> <p>5 MR. ASSAAD: Oh, really?</p> <p>6 MR. GOSS: I'm not going to tell him to</p> <p>7 answer the question. He's already answered it.</p> <p>8 MR. ASSAAD: No, he hasn't.</p> <p>9 Q. I'm asking as a --</p> <p>10 I didn't ask for one specific data, I'm</p> <p>11 asking data as a whole. Since there's no methodology</p> <p>12 and it's not reproducible, therefore it can't be</p> <p>13 reliable; correct?</p> <p>14 MR. GOSS: You can't --</p> <p>15 You haven't gone over all the data.</p> <p>16 MR. ASSAAD: I don't need to go over --</p> <p>17 Q. Exhibit B of your report, there's no</p> <p>18 methodology, can't be reproducible, therefore it's not</p> <p>19 reliable; correct?</p> <p>20 MR. GOSS: Objection, asked and answered.</p> <p>21 A. If -- if that's how you define "reliable," I</p> <p>22 will agree with that.</p> <p>23 Q. Well how do you define "reliable?"</p> <p>24 A. I think I would say something that -- that</p> <p>25 could be reproduced.</p>
<p style="text-align: right;">Page 250</p> <p>1 Q. Okay. There's definitely no methodology</p> <p>2 here that's indicated in this report; correct?</p> <p>3 A. Yes.</p> <p>4 Q. And as of right now, the reliability is very</p> <p>5 questionable; correct?</p> <p>6 MR. GOSS: Objection to form, asked and</p> <p>7 answered.</p> <p>8 A. I would -- I would say reproducing the</p> <p>9 results here would -- would be difficult.</p> <p>10 Q. And therefore, if you can't reproduce the</p> <p>11 results, not reliable.</p> <p>12 MR. GOSS: Objection to form, asked and</p> <p>13 answered.</p> <p>14 Q. Correct?</p> <p>15 A. I think I answered that.</p> <p>16 Q. Correct?</p> <p>17 MR. GOSS: Objection to form, asked and</p> <p>18 answered.</p> <p>19 A. I think I answered that.</p> <p>20 Q. Are you afraid to answer this question</p> <p>21 again? It's a simple question.</p> <p>22 MR. GOSS: Objection, argumentative,</p> <p>23 badgering.</p> <p>24 MR. ASSAAD: Counsel, tell him to answer the</p> <p>25 question.</p>	<p style="text-align: right;">Page 252</p> <p>1 Q. We can't reproduce this; can we?</p> <p>2 A. Not with what's here, no.</p> <p>3 Q. Okay. So therefore this report, based on</p> <p>4 what's here, is not reliable.</p> <p>5 MR. GOSS: Objection to form.</p> <p>6 A. By inference, yes, I agree.</p> <p>7 MR. ASSAAD: Let's take a break.</p> <p>8 THE REPORTER: Off the record, please.</p> <p>9 (Recess taken.)</p> <p>10 BY MR. ASSAAD:</p> <p>11 Q. You don't consider yourself an expert with</p> <p>12 respect to how skin squames are transported in an</p> <p>13 operating room; correct?</p> <p>14 A. That's true.</p> <p>15 Q. You are aware that skin squames carry</p> <p>16 bacteria; correct?</p> <p>17 A. Yes.</p> <p>18 Q. And are you aware that between one million</p> <p>19 to 900 million skin squames are shed during a typical</p> <p>20 surgery?</p> <p>21 A. I do not -- have not heard that number</p> <p>22 before.</p> <p>23 Q. Are you familiar with the HVAC Design Manual</p> <p>24 for Hospitals and Clinics?</p> <p>25 A. The ASHRAE --</p>

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<p style="text-align: right;">Page 253</p> <p>1 Q. Yes.</p> <p>2 A. -- Hospital Design Guide? Yes, I am.</p> <p>3 Q. And actually one of the contributors was Dan</p> <p>4 Koenigshofer?</p> <p>5 A. Yes.</p> <p>6 Q. Have you read the HVAC Design Manual for</p> <p>7 Hospitals and Clinics recently?</p> <p>8 A. I have --</p> <p>9 I don't think I'd read it prior to this --</p> <p>10 this case, no.</p> <p>11 Q. But you agree to -- for it to be</p> <p>12 authoritative, correct, in your -- in your field of</p> <p>13 work?</p> <p>14 A. In my opinion, yes, sir.</p> <p>15 Q. Okay.</p> <p>16 (Kuehn Exhibit 13 was marked for</p> <p>17 identification.)</p> <p>18 MR. ASSAAD: Did you say 13?</p> <p>19 THE REPORTER: Yes.</p> <p>20 BY MR. ASSAAD:</p> <p>21 Q. Now if you look on page v or five, Table of</p> <p>22 Contents --</p> <p>23 And I represent to you that I -- that I did</p> <p>24 not print out the entire manual, just some relevant</p> <p>25 parts. Fair enough?</p>	<p style="text-align: right;">Page 255</p> <p>1 Q. Also like you to turn to page 154, upper</p> <p>2 left-hand corner. Are you there?</p> <p>3 A. Yes.</p> <p>4 Q. Under 8.3 it discusses operating rooms.</p> <p>5 Have you read this section before?</p> <p>6 A. I believe I have.</p> <p>7 Q. First sentence, "The purposes of the HVAC</p> <p>8 system in an operating room are to minimize infection,</p> <p>9 maintain staff comfort, and maintain patient comfort."</p> <p>10 Did I read that correctly?</p> <p>11 A. You did read that correctly.</p> <p>12 Q. Do you agree with that?</p> <p>13 A. I do.</p> <p>14 Q. Now you agree with me that ASHRAE is a</p> <p>15 standard -- a -- a minimum standard; correct?</p> <p>16 MR. GOSS: Objection, form.</p> <p>17 A. It's intended to be a minimum standard, yes.</p> <p>18 Q. Okay. It doesn't mean it's the best</p> <p>19 practice, it's just a minimum standard; correct?</p> <p>20 MR. GOSS: Objection to form, vague.</p> <p>21 A. That's typically the way -- well, this is</p> <p>22 a --</p> <p>23 This is not an ASHRAE standard, it's an HVAC</p> <p>24 Design Manual for Hospitals and Clinics, so I would</p> <p>25 say this would be best practice.</p>
<p style="text-align: right;">Page 254</p> <p>1 A. Yes.</p> <p>2 Q. I'd like you to turn to page 27. And it's</p> <p>3 not in order, actually The page after that</p> <p>4 A. Okay.</p> <p>5 Q. If you look at the highlighted section, it</p> <p>6 states here, "Between 1 million and 900 million</p> <p>7 squames are shed during surgery." Do you see that?</p> <p>8 A. That's what it says.</p> <p>9 Q. Okay. Do you disagree with that?</p> <p>10 A. I do not disagree with that.</p> <p>11 Q. And actually, since you agreed this is</p> <p>12 authoritative, you must agree with it; correct?</p> <p>13 A. Yes.</p> <p>14 Q. Go to page 26, last paragraph. States,</p> <p>15 "Operating rooms are one of the most critical areas</p> <p>16 for infection control..." Do you agree with that?</p> <p>17 A. I do.</p> <p>18 Q. Continues, "...this is where patients are</p> <p>19 opened to the surrounding environment while in an</p> <p>20 immune-suppressed condition." Do you agree with that?</p> <p>21 A. Yes.</p> <p>22 Q. "The patient is vulnerable to attack from</p> <p>23 any infectious agents that get into the room and into</p> <p>24 the surgical site." Do you agree with that?</p> <p>25 A. Yes.</p>	<p style="text-align: right;">Page 256</p> <p>1 Q. Okay. And you agree that ASHRAE, any of the</p> <p>2 standards or best practices do not apply to medical</p> <p>3 devices; correct?</p> <p>4 A. I believe that's a correct statement.</p> <p>5 Q. So to determine or to select a filter for a</p> <p>6 medical device, you have to look at how the medical</p> <p>7 device is used and the environment of use; correct?</p> <p>8 A. That's correct.</p> <p>9 Q. Okay. The ASHRAE standard has -- is not</p> <p>10 applicable at all to medical devices such as the Bair</p> <p>11 Hugger; correct?</p> <p>12 A. It was not intended to be used for medical</p> <p>13 devices.</p> <p>14 Q. Go to page 157. There's a diagram that's</p> <p>15 highlighted. That's an operating room, --</p> <p>16 A. Yes.</p> <p>17 Q. -- a schematic of an operating room;</p> <p>18 correct?</p> <p>19 A. Yes.</p> <p>20 Q. Are you familiar with how an HVAC system</p> <p>21 works in an operating room?</p> <p>22 A. Not having worked with operating rooms</p> <p>23 personally, I rely on documents such as this.</p> <p>24 Q. How many filters does -- does the air go</p> <p>25 through before it enters an operating room?</p>

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1 **A. I would -- as --**
 2 **As what I have read, it's typically two.**
 3 Q. Okay. There's a -- there's a prefilter,
 4 which is usually like a MERV 7, and then the MERV 14
 5 filter; correct?
 6 **A. Yes.**
 7 Q. Okay. And you agree with me that an
 8 operating room ventilation system is not drawing from
 9 air below the operating room table; correct?
 10 **A. Say that again.**
 11 Q. It's not drawing -- the intake that --
 12 The air where it's drawing from is not from
 13 below the operating room table; correct?
 14 **A. It's -- it's not from below the table, it's**
 15 **from below sidewall return grilles.**
 16 Q. And it's usually about 75 percent recycled
 17 air and 25 percent fresh air; correct?
 18 **A. I recall 80/20, but you may be correct.**
 19 Q. 80/20, depending on the system.
 20 **A. Yes.**
 21 Q. Okay. And you agree with me that in this
 22 picture here it talks about the heat sources that are
 23 typical in an operating room; correct?
 24 **A. It does, yeah.**
 25 Q. Talks about the equipment of one kilowatt;

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1 of --
 2 Well let's put it this way: When you look
 3 at a problem, you have to look at the whole picture;
 4 correct?
 5 **A. Yes.**
 6 Q. You can't just take a -- a Bair Hugger and
 7 put it in isolation and not take into account the
 8 barriers in airflow of the operating room and how many
 9 people are in the operating room and the devices in
 10 the operating room; correct?
 11 **A. That would be my assumption, yes.**
 12 Q. Okay. And you did not do that in this case;
 13 correct? You didn't take into account the people in
 14 the operating room; correct?
 15 MR. GOSS: With respect to what part of the
 16 report?
 17 MR. ASSAAD: Any of the studies he's done,
 18 any of the testing he did.
 19 **A. The only testing I did was with -- with the**
 20 **Bair Hugger.**
 21 Q. So you didn't take any of the people into
 22 account; correct?
 23 **A. Not with those tests, no.**
 24 Q. Do you know why medical devices are --
 25 strike that.

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1 correct?
 2 **A. Yes.**
 3 Q. All right. And how many watts is the Bair
 4 Hugger for producing -- how much --
 5 How many watts of heat is it producing?
 6 **A. Off the top of my head I -- I --**
 7 **I could hazard a guess, but I don't want to**
 8 **give you an exact number. I don't recall.**
 9 Q. Would that be something important to know,
 10 the effect of --
 11 **A. It -- it -- it --**
 12 **Yes.**
 13 Q. -- of a unit in an operating room?
 14 **A. Yes.**
 15 Q. But you don't know that information sitting
 16 here today.
 17 **A. I could -- I could hazard a guess, but I**
 18 **don't know the exact number.**
 19 Q. Again, I don't want guessing, I want your
 20 expert opinion.
 21 **A. Okay. I cannot give you an exact number at**
 22 **this point.**
 23 Q. You agree that people produce heat; correct?
 24 **A. Yes.**
 25 Q. And that should be taken into account of --

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1 Do you know why prosthetic surgeries or
 2 orthopedic surgeries have a higher risk of surgical-
 3 site infection?
 4 **A. Not being a surgeon, I really can't answer**
 5 **that.**
 6 Q. Do you know whether or not the number of --
 7 number of bacteria required to cause a periprosthetic
 8 joint infection is the same as a superficial knee
 9 infection?
 10 **A. I --**
 11 **Again, not being a surgeon or**
 12 **microbiologist, I -- I cannot comment on that.**
 13 Q. Now you've read Dr. Elghabashi's report;
 14 correct?
 15 **A. His report, yes.**
 16 Q. Okay. Do you understand his report?
 17 **A. I do.**
 18 Q. Okay. You've gone through all the
 19 calculations or the equations?
 20 **A. Not in sufficient detail, but I -- I get**
 21 **them, that he's done it correctly.**
 22 Q. Okay. So you agree with me that all the
 23 calculations that Elghabashi has done with respect to
 24 the analysis of an operating room was done correctly.
 25 **A. With the exception of the assumption of 106-**

65 (Pages 257 to 260)

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1 degree Fahrenheit air leaving the blanket, which I
2 don't think is correct.
3 Q. Okay. That's the only criticism you have of
4 his report.
5 A. No. I also criticized the number of
6 particles he assumed was getting at the -- into the
7 critical-care area, the infection box.
8 Q. And why do you criticize that?
9 A. He lists very large numbers of particles
10 originating near the floor ending up near the -- near
11 the critical-care area when the Bair Hugger was on,
12 and my criticism of that was the -- it's approximately
13 a million particles near the floor that he's using in
14 his calculations to arrive at his number near the
15 critical-air area.
16 Q. Okay. What number should he have used?
17 A. I -- I suggest he use the most appropriate
18 value of CFU of bacteria aerosols per cubic meter per
19 cubic foot that's available in the literature.
20 Q. And that you found was 10 CFU's per cubic --
21 per cubic meter?
22 A. I went back to Galson and Goddard, the
23 number I included in my report, which I think is -- is
24 high, but I used that as a starting point.
25 Q. Which was what?

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1 A. His total particle count, yes, I think it
2 was three.
3 Q. One -- one million in each section; correct?
4 A. That's -- that's my understanding.
5 Q. That's on the lower side of 900 million;
6 correct?
7 A. Repeat the question.
8 Q. I mean three million is much lower than 900
9 million.
10 A. Yes.
11 Q. Okay. And the squim -- the squib scale --
12 The skin squames, they fall from the patient
13 as well as the surgical staff; correct?
14 A. Yes.
15 Q. They're around the operating room; correct?
16 A. Yes.
17 Q. Do you know whether or not the value taken
18 by Galson and Goddard were underneath the operating
19 room table around the surgical site, or just the
20 average in an OR?
21 A. I -- I do not know the precise location for
22 their measurement.
23 Q. That would be kind of important, wouldn't
24 it, before you criticize another expert in this case?
25 MR. GOSS: Objection to form.

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1 A. I have to look in my report.
2 Q. Please do.
3 Let me help you out here. Let's go to page
4 13 of your report.
5 A. I -- I -- yes. Thank you. I found page 13.
6 I was looking at the exhibits and it wasn't there.
7 I see the number four CFU per cubic foot.
8 Q. Okay. What would that be per cubic meter?
9 A. Roughly -- it would be roughly 10 times
10 that.
11 Q. So about 40?
12 A. Roughly 40, yes.
13 Q. Okay. And you got this number from where?
14 A. From --
15 This was published years ago by a reference,
16 Galson and Goddard, an ASHRAE journal article.
17 Q. So we just read ASHRAE, which you consider
18 authoritative, that said between 100 and 900 million
19 skin squames fall during a typical surgery; correct?
20 A. That's what it said, yes.
21 Q. Okay. And you don't disagree with that;
22 correct?
23 A. No.
24 Q. Okay. And Elghabashi used three million,
25 correct, skin squames?

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1 A. Well yes.
2 Q. I mean -- I mean we know at least one
3 million skin squames fall during a typical surgery
4 according to authoritative ASHRAE.
5 A. Yes.
6 Q. Okay. So --
7 And Dr. Elghabashi has never stated in his
8 report that those were colony-forming units, he just
9 said they were skin squames; correct?
10 A. I think he defined them as 10-micron
11 particles.
12 Q. Okay. He didn't say they were bacteria or
13 CFUs, he just said they were skin squames; correct?
14 A. Well as I recall he called them 10-micron
15 particles.
16 Q. Do you understand how he calculated them to
17 be 10-micron particles?
18 A. I -- I don't know how he arrived at it.
19 Q. Did you not look at his appendix in -- in
20 his report?
21 A. I cannot recall that at the moment.
22 Q. Okay. And are you aware that Farhad
23 Memarzadeh, as I like to call him, also used a 10-
24 micron sphere as a shape that would be equivalent to a
25 skin squame?

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1 **A. I don't recall seeing that article. I can't**
2 **comment on that.**

3 Q. Are you aware that 3M cites that article on
4 numerous letters that they send to their valued
5 customers, doctors?

6 **A. I -- I am not aware of that, no.**

7 Q. You haven't seen any of those documents;
8 have you?

9 **A. I have not.**

10 Q. Okay. And do you understand why he used a
11 10-micron particle?

12 **A. Yes.**

13 Q. Why?

14 **A. That -- that's a particle that could contain**
15 **infectious bacteria.**

16 Q. Do you know why he used a spherical particle
17 instead of the shape of a skin squame?

18 **A. It's much easier to calculate in terms of**
19 **the numerical methodology.**

20 Q. Are -- are you --

21 **Can CFD calculate particle movements that**
22 **are not spheres?**

23 **A. It's very difficult. Typically, what one**
24 **does is use what's called aerodynamic diameters, which**
25 **takes into account the particle shape, density, and**

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1 **that sort of thing.**

2 Q. Exactly. And that's why you use a 10-micron
3 sphere. And if you look at his calculation, that's
4 how he calcu -- that's the aerodynamic diameter of a
5 skin squame, of an average skin squame. Do you agree
6 with that?

7 **A. I -- I don't -- I don't know that I've seen**
8 **that information, but that seems reasonable.**

9 Q. Okay. You don't disagree with the 10-micron
10 size.

11 **A. I don't disagree with it.**

12 Q. Okay. So the two things that you disagree
13 with Elghabashi are the amount of skin squames -- or
14 particles on the floor --

15 Were they on the floor or above the floor?

16 **A. Above the floor. They were in a given**
17 **volume.**

18 Q. Huh?

19 **A. They were in a specified volume above the**
20 **floor.**

21 Q. But they weren't on the floor.

22 **A. No.**

23 Q. Do you know why he didn't put them on the
24 floor?

25 **A. I -- I -- I do not know his reasoning, no.**

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1 Q. Okay. And the other criticism is the
2 temperature coming out of the blanket.

3 **A. Yes.**

4 Q. Okay. And that's based on your own
5 measurements that you did in Exhibit B; correct?

6 **A. Yes.**

7 Q. Okay. So what's your basis, if we're just
8 talking about particles or skin squames -- squames,
9 that using three million around the operating table is
10 unreasonable when ASHRAE states that between one --
11 one million to 900 million are shed during surgery?

12 **A. Well "shed during surgery" means the entire**
13 **duration of the surgical procedure I would assume, you**
14 **know, so therefore, since the room air is changing**
15 **every -- or there's 15 to 20 air changes per hour,**
16 **then most of these would follow airflow out of the**
17 **room or be deposited on surfaces.**

18 Q. What's the airflow underneath the operating
19 room table?

20 **A. The air change rate's probably quite low.**

21 Q. Is there any change -- air-change rate?

22 **A. There's probably some.**

23 Q. Very minimal; would you agree?

24 **A. That's -- that's -- that's probably true.**
25 **(Kuehn Exhibit 14 was marked for**

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1 **identification.)**

2 BY MR. ASSAAD:

3 Q. Dr. Kuehn, I represent that Exhibit 14 is a
4 CFD image -- or an image produced by CFD by defense
5 expert Dr. Abraham. Have you seen this document
6 before?

7 **A. I have not.**

8 Q. Do you understand what this document is by
9 looking at it as a -- as an engineer?

10 **A. I have a rough idea, yes.**

11 Q. Would you agree with me that's airflow based
12 on a CFD analysis of an operating room? Correct?

13 **A. I'm not sure I have the entire image here.**
14 **Looks like the walls are missing on the left- and**
15 **right-hand sides.**

16 Q. But it's airflow in an operating room with
17 there being a surgical table and a patient and lights
18 and everything.

19 **A. That's what it looks like, yeah.**

20 Q. And that's what I represent to you, that
21 this was produced to us by defense in this case.

22 Do you see the -- the vectors of air
23 underneath the operating room table?

24 **A. Yes.**

25 Q. You see that it's very turbulent underneath

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1 there; correct?
 2 **A. A lot of recirculation, yes.**
 3 Q. And this supports your opinion that there's
 4 probably very little air exchange underneath the
 5 operating room table; correct?
 6 **A. Well less than the other parts of the room.**
 7 Q. Much less.
 8 **A. It would also depend on the -- the drapes**
 9 **hanging down, how -- how far the edge of the drapes**
 10 **are above the floor.**
 11 Q. The longer the drapes, the less --
 12 **A. Less --**
 13 Q. -- air exchange; correct?
 14 **A. Yes.**
 15 Q. And it creates more of an insulation from
 16 the air.
 17 **A. Yes.**
 18 Q. Okay. And when you have insulation, you
 19 have less airflow going in and out of the area
 20 underneath the drapes; correct?
 21 **A. Yes.**
 22 Q. Okay. And since you have less airflow going
 23 in and out of the drapes, you have less of a cooling
 24 effect; correct?
 25 **A. Less --**

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1 Q. Okay. And by convection it's going to warm
 2 the patient as well as underneath the drapes; correct?
 3 **A. Yes.**
 4 Q. Okay. And over time the air underneath the
 5 drapes is going to increase; correct?
 6 **A. That's possible.**
 7 Q. Well if you have the drapes around the
 8 table, okay, and you're getting very little air
 9 movement underneath the table, by the first law of
 10 thermodynamics, the conservation of energy, okay, the
 11 heat has to warm up something; correct?
 12 **A. Well it depends on where the air is actually**
 13 **leaving the blanket with respect to the drapes.**
 14 Q. Do you think the air could pass through the
 15 drapes?
 16 **A. No.**
 17 Q. Okay. So we know the air is not leaving
 18 through the drapes; correct?
 19 **A. Yes.**
 20 Q. And the drapes act like some sort of
 21 insulation, kind of like when you all have blankets on
 22 us at night, it acts like an insulation; correct?
 23 **A. Yes.**
 24 Q. That's why --
 25 I mean when you sleep at night, the blankets

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1 Q. Well the air is pretty -- pretty stagnant
 2 underneath the operating room table if the drapes are
 3 long; correct?
 4 **A. Yes.**
 5 Q. Okay. And you have the Bair Hugger that's
 6 underneath the drapes that's heating up that area,
 7 correct?
 8 MR. GOSS: Objection, form.
 9 **A. That's not the way we set our Bair Hugger**
 10 **up.**
 11 Q. Oh, it isn't?
 12 **A. No.**
 13 Q. Why not?
 14 MR. GOSS: Are you talking about the blanket
 15 or the warming unit?
 16 MR. ASSAAD: The blanket.
 17 **A. Oh, the blanket. I'm sorry. I thought you**
 18 **meant the -- the warming unit.**
 19 Q. No. The blanket's underneath the drapes;
 20 correct?
 21 **A. Yes.**
 22 Q. Okay. And you agree with me at some point,
 23 you know, the Bair Hugger blanket is going to warm the
 24 actual drapes on top through conduction; correct?
 25 **A. Yes.**

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1 don't warm you up, your own body heat warms you up, it
 2 just acts as an insulator to keep you warm; correct?
 3 **A. Yes.**
 4 Q. The same concept applies here with the Bair
 5 Hugger, correct, and the drapes?
 6 **A. Yes. The Bair Hugger is providing warmth to**
 7 **the patient, yes.**
 8 Q. And the drape is keeping all the -- it's --
 9 it's insulating the patient and the area underneath
 10 the drapes from the cold air up top; correct?
 11 **A. Yes.**
 12 Q. Okay. The only way that that cold air
 13 coming in from the ceiling could warm up the air
 14 underneath the operating room table is either by
 15 having air coming in from the sides underneath the
 16 drapes --
 17 Correct?
 18 **A. Yes.**
 19 Q. -- or it warms the air -- warms the blanket
 20 by convection and then the blanket -- the drape, I'm
 21 sorry, warmed by con -- convection, and then the drape
 22 warms the Bair Hugger blanket by convection and cools
 23 it down to blow cold air, which doesn't happen in real
 24 life; correct?
 25 **A. Yes.**

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1 Q. Okay. So over time energy has --
 2 Energy, first law of thermodynamics, is
 3 conserved, and the area underneath the operating room
 4 table, which is -- doesn't have a significant amount
 5 of air exchanges, gets warmer and warmer, correct,
 6 until it reaches an equilibrium?
 7 **A. I'll agree with that.**
 8 Q. Okay. And sitting here today, you don't
 9 disagree with Dr. Abraham's CFD analysis as shown in
 10 Exhibit 14; correct?
 11 **A. Well not having looked at any of the other**
 12 **background information or boundary conditions, just**
 13 **given this one figure, this figure's results look**
 14 **reasonable, but I'd really like to look at the other**
 15 **part of his report before I answered that question.**
 16 Q. And you never asked for his report from 3M;
 17 have you?
 18 **A. I --**
 19 **No, I did not.**
 20 Q. Do you know how much heat -- what's the
 21 right term?
 22 Do you know how much heat is absorbed by a
 23 human body in the torso region?
 24 **A. I do not know that.**
 25 Q. Okay. Would that be something important to

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1 **A. Yes.**
 2 Q. Just a different design; correct?
 3 **A. Right.**
 4 Q. And that's based -- and -- and that's an
 5 engineer -- that's that they're --
 6 They're the same product with different
 7 design; correct?
 8 **A. Same --**
 9 Q. Product. They're both pat --
 10 They're all patient warming products;
 11 correct?
 12 **A. Same -- same application --**
 13 Q. Yes.
 14 **A. -- but just different products.**
 15 Q. Different products or different designs?
 16 **A. Well different designs and different**
 17 **products.**
 18 Q. What's different between the Mistral and the
 19 Bair Hugger?
 20 **A. I have not looked at the Mistral in any**
 21 **amount of detail, so I -- I can't answer that.**
 22 Q. There's three modes of heating: convective,
 23 conductive, and radiation; correct?
 24 **A. Yes.**
 25 Q. Do you know a Dr. Sparrow?

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1 know to determine how much of the heat produced by the
 2 Bair Hugger is actually absorbed by the body and how
 3 much of it's waste heat?
 4 MR. GOSS: I don't think he's offering any
 5 opinions on that, but you can answer.
 6 **A. If -- if I was in the design area, I think**
 7 **that would be something I would want to know.**
 8 Q. You're aware that there's different patient
 9 warming products --
 10 **A. Yes.**
 11 Q. -- as we discussed previously.
 12 **A. Yes.**
 13 Q. They're just different designs; correct?
 14 **A. Yes.**
 15 Q. One design might be forced-air warming;
 16 correct?
 17 **A. Yes.**
 18 Q. Another design might be conductive warming;
 19 correct?
 20 **A. Yes.**
 21 Q. You've heard of conductive warming
 22 mattresses; correct?
 23 **A. I believe so, yes.**
 24 Q. Okay. They're all patient warming products;
 25 correct?

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1 **A. I do.**
 2 Q. Are you friends with him?
 3 **A. We're colleagues, yeah.**
 4 Q. Have you done any work with him?
 5 **A. No, not -- not really, other than I may have**
 6 **served on some of his graduate students' final exam**
 7 **committees.**
 8 Q. And he focuses on heat transfer as well;
 9 correct?
 10 **A. Yes.**
 11 Q. Is there anyone at the University of
 12 Minnesota that focuses on particle movement through
 13 turbulent airflow?
 14 **A. I could think of Mike Zacharia probably,**
 15 **does a lot of modeling work in that area.**
 16 Q. Is he from Stanford?
 17 **A. No, I think he's from the University of New**
 18 **York - Buffalo.**
 19 Q. Okay.
 20 **A. What name did I give you? I just want to**
 21 **make sure I gave you the correct --**
 22 Q. Zacharia.
 23 **A. That's -- that's not correct.**
 24 MS. ZIMMERMAN: University of Minnesota is a
 25 big school.

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1 THE WITNESS: Yeah.
 2 **A. I'm just having a mental --**
 3 **I'll -- I'll -- I'll come up with it.**
 4 Q. Not important.
 5 **A. I'll come up with it.**
 6 Q. It's not important.
 7 **A. Oh. Sean Garrick is -- G-a-r-r-i-c-k, I**
 8 **believe. Sean Garrick.**
 9 Q. And he went to SUNY Buffalo?
 10 **A. Yes.**
 11 Q. Okay. Do you know whether or not the
 12 University of Minnesota has their own CFD code?
 13 **A. I don't think so, but I'm not -- not aware**
 14 **of that.**
 15 Q. Are you aware that like universities such as
 16 Stanford have their own code?
 17 **A. Yes.**
 18 Q. Okay.
 19 **A. I -- not --**
 20 **Not that I'm aware of.**
 21 Q. Okay.
 22 **A. I mean individual researchers have their own**
 23 **code, but whether there's a blanket University of**
 24 **Minnesota code, I am not aware of any such thing.**
 25 Q. Now you agree with me that in selecting a

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1 determining the filtration to be used by the device;
 2 correct?
 3 **A. Yes. The -- the challenge aerosol into the**
 4 **device would have to be taken into account, into the**
 5 **filter.**
 6 Q. Because using a MERV 14 that removes 95
 7 percent of the part -- of particles the size of -- or
 8 90 percent -- 90 percent of the particles larger than
 9 three to 10 microns means that some get through;
 10 correct?
 11 **A. And the numbers you're referring to appear**
 12 **to be from the ASHRAE Standard 52.2. Those are**
 13 **minimum values for that particle-size range.**
 14 Q. That's fine. But --
 15 It's a percentage; correct?
 16 **A. Yes.**
 17 Q. Okay. And you have to take into account in
 18 designing a device, when you're putting a filter in
 19 it, is what is the bacterial load, because allowing 10
 20 percent of a low number to get through is different
 21 than allowing 10 percent of a large number to get
 22 through; correct?
 23 **A. Yes.**
 24 **MR. GOSS: Object to form.**
 25 **Q. And the bacterial load underneath the**

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1 filter to be used in a -- in a device during the
 2 design process, you have to know how that device is
 3 going to be used; correct?
 4 **A. Yes.**
 5 Q. And you agree with me that that -- that
 6 that -- the air that the bacteria -- strike that --
 7 the air that the Bair Hugger is filtering has a higher
 8 bacterial load than the air coming out of that
 9 ventilation system; correct?
 10 **A. That -- that may be the case. I have not**
 11 **seen data that supports that, I don't believe.**
 12 Q. Let's just use common sense. You have
 13 squames from people and the patient and blood and
 14 other stuff during the surgical procedure that's going
 15 down to the floor of the operating room; correct?
 16 **A. Okay.**
 17 Q. Okay. I mean it would be a -- a reasonable
 18 conclusion that the bacterial load in that area around
 19 the surgical table is much greater than coming out of
 20 the ventilation system, which has 25 percent air
 21 coming from the outside as well as being filtered
 22 twice through a -- through a HEPA -- a MERV -- a MERV
 23 7 filter and a MERV 14 filter; correct?
 24 **A. That would be a logical assumption, yes.**
 25 Q. And that needs to be taken into account in

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1 operating room table is much greater than coming out
 2 of the HVAC system; correct?
 3 **A. I think we could probably assume that.**
 4 Q. And you have to take that into consideration
 5 in choosing the correct filter for the device;
 6 correct?
 7 **A. Depends where the device is located.**
 8 Q. Well where is the Bair Hugger located?
 9 **A. Sometimes it's on an IV pole, sometimes it's**
 10 **mounted on a cart.**
 11 Q. Either/or. Why does it make a difference?
 12 **A. The location of the air coming in will be**
 13 **different than, for example, under the operating**
 14 **table.**
 15 Q. Do you know how high, when you use it -- put
 16 on a pole, how high it's off the ground, the Bair
 17 Hugger?
 18 **A. Typically, the bottom I've heard is between**
 19 **18 inches and two feet.**
 20 Q. Okay. And that's still below the operating
 21 room table; correct?
 22 **A. Below the top of the table, yes.**
 23 Q. Okay. And as we discussed before from
 24 Exhibit 14, the air is very turbulent underneath that
 25 area; correct?

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1 **A. Yes.**
 2 Q. So particles are all over the place in that
 3 area; correct?
 4 **A. Yes.**
 5 Q. We could agree that the concen -- the
 6 bacterial load concentration is probably pretty
 7 uniform underneath the operating room table due to the
 8 turbulence; correct?
 9 **A. Under the table, yes.**
 10 Q. Okay. So it really doesn't matter if it's
 11 on the floor, you know, on a stand or -- or on a pole
 12 which is below the operating table, it's still drawing
 13 from the same amount of bacterial load; correct?
 14 **A. But it's not under the operating table.**
 15 Q. It isn't?
 16 **A. The unit when it's -- when it's placed, no.**
 17 Q. Where is it placed?
 18 **A. It's placed behind the anesthetic screen.**
 19 Q. Behind the screen.
 20 **A. Yes.**
 21 Q. Well just --
 22 And -- and the screen is not above the
 23 operating room table?
 24 **A. The screen is above the table, yes.**
 25 Q. Okay. So it's placed -- and -- and when

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1 **coming over the table near the floor where the unit is**
 2 **located, which would still be very clean air.**
 3 Q. But sitting here today, you don't know
 4 either way; do you?
 5 **A. Say it again.**
 6 Q. Sitting here today, you don't know either
 7 way what the bacterial load is, whether or not the
 8 area where the Bair Hugger sits has air from the
 9 ceiling clearing out the bacteria.
 10 **A. Not -- not without seeing actual**
 11 **applications.**
 12 Q. Okay. Assuming that it is underneath the
 13 operating room table --
 14 Okay?
 15 **A. Okay.**
 16 Q. -- or an area where there is turbulence, and
 17 the HVAC system can't clear out the bacterial load, --
 18 **A. Okay.**
 19 Q. -- would you agree with me that a MERV 14
 20 filter -- strike that.
 21 You agree with me that just because a
 22 hospital operating room uses a MERV 14 filter, that is
 23 a sufficient reason to use a MERV 14 filter in the
 24 Bair Hugger?
 25 **A. I would say it's not a sufficient reason.**

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1 you -- and who told you --
 2 Where did you come up with this assumption?
 3 Who told you that?
 4 **A. Well based on the photos I've -- I've seen**
 5 **as how a typical Bair Hugger unit would be set up, and**
 6 **the setup in the 3M lab.**
 7 Q. How long is the hose?
 8 **A. I'm guessing --**
 9 **Well, I don't know the exact number.**
 10 Q. So it's your belief that the area where the
 11 Bair Hugger is placed has the same bacterial load as
 12 the areas coming out from the HVAC.
 13 **A. I did not say that.**
 14 Q. Okay. That's --
 15 I just want to make sure. So what are you
 16 saying?
 17 **A. I'm saying it's -- it's -- it could be**
 18 **significantly different than what's under the table.**
 19 Q. Okay. But you agree it's still
 20 significantly more than what's coming out of the HVAC
 21 system.
 22 **A. It could be, depending on where the unit is**
 23 **located.**
 24 Q. Well the hose is only so long.
 25 **A. But there could be airflow from the ceiling**

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1 Q. Okay. And you agree with me that you have
 2 been provided no data with respect to the bacterial
 3 load underneath the operating room table.
 4 **A. I believe that's a correct statement.**
 5 Q. Okay. And to choose a filter, a reasonable
 6 and prudent engineer should know the bioburden of the
 7 air that the bacter -- that the Bair Hugger is drawing
 8 from in selection of a filter; correct?
 9 **A. That would be prudent, yes.**
 10 Q. Okay. Do you have any reason to believe
 11 that -- that 3M or Arizant considered that in
 12 selecting the MERV 14 -- selecting their filter?
 13 **A. I cannot point to a document that says that,**
 14 **no.**
 15 Q. Okay. Do you know what the efficiency is
 16 for one to three microns of the Bair Hugger filter?
 17 **A. I have seen a test report where the filters**
 18 **have been sent to an external test lab for -- for**
 19 **measurements and --**
 20 Q. So what is it?
 21 **A. It's from -- from .3 to one.**
 22 Q. From one to three.
 23 **A. From one to three. I think it's in the**
 24 **nineties.**
 25 Q. In the nineties. Okay.

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1 And your opinion in this case is that's an
2 acceptable choice; correct?
3 **A. Yes.**
4 **Q. Did you take into account in formulating**
5 **your opinions the -- the -- the bioburden of the air**
6 **that the Bair Hugger is drawing from?**
7 **A. Not specifically.**
8 **Q. What does that mean, "not specifically?"**
9 **A. I was looking at the most probable particle**
10 **size containing a -- a bacteria and how the filter**
11 **would -- would perform against that particle size.**
12 **Q. And what's that? What size?**
13 **A. Size between five and 10 microns.**
14 **Q. Okay. What's the efficiency for five to 10**
15 **microns?**
16 **A. The data I show, it's high nineties, close**
17 **to a hundred percent.**
18 **Q. Were you aware that they performed a test on**
19 **the filter --**
20 **You've read Winston Tan's report; correct?**
21 **A. That's what I'm referring to, yes.**
22 **Q. Okay. And actually, they ran initial tests**
23 **and the first -- first test results were not good**
24 **because of a manufacturing defect. Do you recall**
25 **that?**

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1 a good seal so that no air could bypass the filter
2 through the sides?
3 **A. It has what appeared to me to be a black**
4 **foam-rubber gasket, that when the filter is placed in**
5 **the bottom of the unit with the cover over it and the**
6 **bolts tightened down, that the gasket is compressed,**
7 **which indicates to me that there would be a good seal.**
8 **Q. But you don't know one way or the other;**
9 **correct?**
10 **A. I have not measured for leakage, no.**
11 **Q. Okay. By the way, you're aware that in**
12 **Elghabashi's study, that he assumed that the filter**
13 **stopped 100 percent of the particles?**
14 **A. I would have to go back and check that level**
15 **of detail. I don't recall at the moment.**
16 **Q. All right. Now you've done research on**
17 **actual bacterial growth that occurs within a filter;**
18 **correct?**
19 **A. That's correct.**
20 **Q. Okay. And as long as there are nutrients**
21 **provided to the bacteria, it actually could go -- grow**
22 **in the filter and -- and grow all the way through the**
23 **filter and then be released on the other side;**
24 **correct?**
25 **A. With appropriate environmental temperature**

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1 **A. There were three batches that were tested,**
2 **and one of the batches, I -- I believe, did not meet**
3 **the requirements.**
4 **Q. Had a manufacturing defect; correct?**
5 **A. That -- that's what I read.**
6 **Q. Okay. And knowing where the --**
7 **Assuming that the Bair Hugger is drawing air**
8 **that has a large bioburden, did you take into account**
9 **whether the device had any leakage?**
10 **MR. GOSS: Object to the predicate.**
11 **A. I didn't --**
12 **Q. Do you know what I mean by "leakage?"**
13 **A. Yes.**
14 **Q. Okay.**
15 **A. Yes. Yes, I did.**
16 **Q. But you didn't test for leakage; correct?**
17 **A. I did no testing, no.**
18 **Q. And the Bair Hugger filter has a seal on it;**
19 **correct?**
20 **A. Which -- which Bair Hugger are you referring**
21 **to?**
22 **Q. The 750 or 775.**
23 **A. 775, yes.**
24 **Q. Did you -- did you check to see whether or**
25 **not, when the Bair Hugger is turned on, that it forms**

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1 **and humidity conditions, yes.**
2 **Q. Okay. What --**
3 **Do you know what the humidity is in -- in an**
4 **OR?**
5 **A. From what the design I have read, I think**
6 **it's supposed to be 50 percent.**
7 **Q. Okay. And that would be an ideal situation**
8 **for bacterial growth; correct?**
9 **A. I think --**
10 **Again, I'm not a microbiologist, but from**
11 **what I've heard from others, I think that's lower than**
12 **what's required to grow and propagate bacteria.**
13 **Q. Do you think --**
14 **What do you think the humidity should be?**
15 **A. I'm -- I'm thinking --**
16 **Q. If you know.**
17 **A. Again, I'm not a microbiologist. I don't**
18 **want to hazard a guess.**
19 **Q. Okay. And why does --**
20 **Why is humidity a factor?**
21 **A. Again, I'm not a microbiologist, but**
22 **humid --**
23 **Bacteria needs -- needs moisture to grow.**
24 **Q. What's a loaded filter?**
25 **A. The common term "loaded filter" typically**

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1 refers to a -- in -- in my area of expertise of
 2 ventilation, an HVAC filter that has captured ambient
 3 aerosol and dust over a fairly long period of time so
 4 that it affects the filter performance both in
 5 pressure drop and -- and capture efficiency.
 6 Q. And what's a long period of time?
 7 A. It really depends on the -- the loading. It
 8 could be years if it's lightly loaded, it could be in
 9 a matter of weeks or months.
 10 Q. Okay. Do you agree that a filter with
 11 sufficient dust loading will contain the nutrients
 12 necessary to support mi -- microbial growth?
 13 A. Our tests on a hundred percent outside air
 14 confirmed that, provided the humidity was high enough.
 15 Q. Well what's high enough?
 16 A. We -- we did not --
 17 We tested two media filters for one year,
 18 hundred percent outside air. We did not find any
 19 bacterial or fungal growth on those filters for the
 20 whole year. We then put them in a test facility that
 21 maintained 90 percent relative humidity, then we did
 22 find growth.
 23 Q. Okay. So you know 90 percent, growth, --
 24 A. Yes.
 25 Q. -- zero percent, no growth.

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1 A. Well I didn't say zero percent. I said just
 2 natural outdoor --
 3 Q. Where were -- where were you?
 4 A. It could range anywhere from in the
 5 wintertime --
 6 Well even in the summer, the early morning,
 7 it could be close to 70, 80 percent, and then during
 8 the hot afternoon it might drop down to 30 or 40.
 9 Q. Okay. You agree with me that skin squames
 10 would be good nutrients for bacteria; correct?
 11 MR. GOSS: Objection, lack of foundation.
 12 A. Again, I'm not a microbiologist. I would --
 13 I would -- I -- I --
 14 I don't want to answer that.
 15 Q. Well you say here in one of your report --
 16 your articles, "Atmospheric dust contains 30 to 40
 17 percent organic matter by mass." Do you remember
 18 that?
 19 A. I think I remember that, yes.
 20 Q. Would you consider skin -- skin squames
 21 organic matter?
 22 A. Yes. I think that was referring to outside
 23 air in that case.
 24 Q. I understand that, but I was talking about
 25 skin squames. Do you consider that organic matter?

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1 A. Skin squames is organic matter, I -- I agree
 2 with that.
 3 Q. Do you know --
 4 Have you done any testing to see whether or
 5 not bacteria could grow in the Bair Hugger over time
 6 and come out the other end?
 7 A. I have not done anything like that, no.
 8 Q. Do you have any reason to believe that it
 9 wouldn't occur in the Bair Hugger filter?
 10 MR. GOSS: Object to form.
 11 A. Again, we need two -- well, we need --
 12 We need sufficient nutrients, number one --
 13 Q. Which we know we have; correct?
 14 MR. GOSS: Object to form.
 15 A. -- which could be -- could be -- could be
 16 the skin squames, but we also need the appropriate
 17 humidity level, and with ORs controlled about 50
 18 percent humidity, I think that's too low.
 19 Q. Okay. But if some ORs are up to 70 percent
 20 humidity, then there's potential for growth?
 21 MR. GOSS: Calls for speculation.
 22 A. I would speculate it has to be higher than
 23 that.
 24 Q. Okay. But you're speculating; correct?
 25 A. Yes.

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1 (Kuehn Exhibit 15 was marked
 2 for identification.)
 3 BY MR. ASSAAD:
 4 Q. What's been marked as Exhibit 15 is an
 5 article titled "Airborne Infection Control in Health
 6 Care Facilities," authored by you; correct?
 7 A. That's correct.
 8 Q. And it's published in an August 2003 -- I
 9 guess in the Journal of Solar Energy Engineering?
 10 A. That's correct.
 11 Q. Okay. Is that a publication put out by
 12 ASME?
 13 A. It is.
 14 Q. I want you to turn to page 369 under
 15 "Monitoring." Do you see that?
 16 A. I see that.
 17 Q. Okay. Do you recall writing this article?
 18 A. I do.
 19 Q. What was the purpose of writing this
 20 article?
 21 A. Professor Jane Davidson asked me for a
 22 contributed article in one of these issues of the
 23 Solar Energy Journal, so I -- I complied with her
 24 request.
 25 Q. Okay. And in "Monitoring" you're talking

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1 about monitoring the -- the critical areas in a clean
 2 room and as well as a healthcare facility; correct?
 3 **A. As I'm reading "Monitoring," it starts out**
 4 **with pressure difference --**
 5 Q. But --
 6 **A. -- between clean zones.**
 7 Q. But this is "Airborne Infection Control in
 8 Health Care Facilities;" correct?
 9 **A. Yes.**
 10 Q. So this is talking about monitoring in those
 11 types of facilities; correct?
 12 **A. Yes.**
 13 Q. Okay.
 14 **A. Uh-huh.**
 15 Q. If you go to the last page -- or the last --
 16 before the --
 17 The next page, it says, "An alternative is
 18 to use a continuous particle counter for the
 19 measurement of total aerosol concentrations versus
 20 time with periodic sampling of bioaerosols." Do you
 21 agree with that statement?
 22 **A. Yes.**
 23 Q. And if you read two lines before that, it
 24 talks about there could be elevated concentrations
 25 that could occur as short-term bursts; correct?

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1 **A. Yes.**
 2 Q. So do you agree that you could use particle
 3 counting to measure the total aerosol concentration in
 4 an operating room?
 5 **A. Within the range of the instrument, yes.**
 6 Q. Okay. And if you used --
 7 Most instruments, they could go from .3 to
 8 10 microns; correct?
 9 **A. Optical particle counters can, yes. There**
 10 **are other instruments that could go much lower and**
 11 **much higher.**
 12 Q. But for the purposes of an operating room,
 13 .3 to 10 microns would be appropriate; correct?
 14 **A. That's a reasonable particle-size range.**
 15 Q. You don't need nanometers at all.
 16 **A. Not -- not --**
 17 **No.**
 18 Q. Yeah. Bacteria are -- are not that small;
 19 correct?
 20 THE REPORTER: Was there an answer?
 21 MR. ASSAAD: I thought he said yes.
 22 Q. But bacteria are not that small; correct?
 23 **A. Yes.**
 24 Q. When a Bair Hugger is turned on, how long do
 25 you think it takes for equilibrium to reach?

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1 **A. How do you define "equilibrium?"**
 2 Q. Well, the Bair Hugger's turned on, the, you
 3 know, Bair Hugger blanket's at room temperature, --
 4 **A. Yes.**
 5 Q. -- the blankets are at room temperature, the
 6 drape is at room temperature, the table is at room
 7 temperature. How long do you think it takes for the
 8 Bair Hugger, when you turn it on, to actually heat up
 9 itself to get to, you know, where it could eject air
 10 at -- at 40 to 41 degrees Celsius and then warm up the
 11 drapes around it and to get to like -- to equilibrium?
 12 **A. The only basis I can reply to that would be**
 13 **the tests we did in the test room.**
 14 Q. And -- and --
 15 **A. And I --**
 16 Q. -- what's your answer? How long?
 17 **A. I recall the --**
 18 **It took a matter of a few minutes before the**
 19 **supply-air temperature was up -- up to design values,**
 20 **and then I -- I don't know how long it would take for**
 21 **the entire hose and the blanket to reach equilibrium.**
 22 Q. Now did you look at the temperature on the
 23 Bair Hugger, of what the exit temperature is?
 24 **A. Not while I was doing my measurements, no.**
 25 Q. Do you know whether or not it was on high or

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1 low or medium?
 2 **A. It was on high. We did --**
 3 **Yes, it was on high.**
 4 Q. And the temperature that it comes out of the
 5 blower, do you know if that temperature being measured
 6 is out of the exit end -- end of the hose or at where
 7 the blower -- where the air comes out of the blower
 8 itself?
 9 **A. I don't recall that level of detail.**
 10 Q. Well you agree with me that that would be
 11 important information to know, to know the actual air
 12 entering into the Bair Hugger blanket, what
 13 temperature it is; correct?
 14 **A. Yes.**
 15 Q. Okay. And -- strike that.
 16 Doctor, assuming that when you did the
 17 temperature in the testing with the Bair Hugger and
 18 you saw an increase of five degrees Celsius over the
 19 assumed surgical site, would that be significant?
 20 **A. Frankly, I was focusing on the velocity**
 21 **measurements, not -- not the temperature measurements,**
 22 **so those were -- that was considered to be secondary**
 23 **measurements in the -- in the study we did. So I was**
 24 **not paying much attention to those, I was paying more**
 25 **attention to the velocity.**

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1 Q. Well you used your temperature measurements
2 to criticize Elghabashi.

3 A. I did.

4 Q. Okay. And to do your Archimedes
5 calculation; correct?

6 A. Yes.

7 Q. Okay. And to do your -- whether or not --
8 The adhesion forces with respect to
9 particles, you used temperature; correct? Used
10 temperature, those temperatures measurements you did
11 in those calculations; correct?

12 A. I don't recall using them in adhesion
13 calculations.

14 Q. You're right. Well -- no, you're right. My
15 fault.

16 If the temperature rose by five degrees over
17 the surgical site, would that be significant to you?

18 MR. GOSS: With the Bair Hugger on.

19 MR. ASSAAD: With the Bair Hugger on.

20 A. If that's the only thing that changed and
21 the airflow did not change at all, I would say
22 that's -- that's not significant.

23 Q. Well how would you think the heat increased?

24 A. Could be from the lights or from personnel.

25 Q. Lights are constant, personnel are constant.

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1 Q. So you have the flow coming down from the
2 ceiling at whatever, 59 degrees Celsius, correct, with
3 a certain velocity; correct?

4 A. Yes.

5 Q. But all of a sudden the Bair Hugger is on
6 and there's a five-degree increase in temperature over
7 the surgical site.

8 A. Yes.

9 Q. What's causing that heat to get up to
10 that -- to that area?

11 MR. GOSS: I'm going to object to 59 degrees
12 Celsius, counsel. It sounds a little hot.

13 MR. ASSAAD: Or 59 degrees Fahrenheit. I'm
14 sorry.

15 MR. GOSS: All right.

16 MR. ASSAAD: Thank you.

17 A. It sounds like it would be coming somewhere
18 from the Bair Hugger.

19 Q. So the heat would be com --

20 It would be from the waste heat of the Bair
21 Hugger; correct?

22 A. That sounds like a logical conclusion, yes.

23 Q. Okay. Let's go to Exhibit D of your report,
24 of Exhibit 1.

25 A. Okay.

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1 Say the Bair Hugger turns on, that's the
2 only change, it goes up five degrees. Would that be
3 significant to you, having everything else constant?

4 A. If everything else is constant, that would
5 be the logical choice.

6 Q. Okay. Would that be significant with
7 respect to airflow disruption?

8 A. It -- it -- it possibly could be.

9 Q. Okay. Do you know who Professor Kurz is --
10 or Dr. Kurz?

11 A. I do not think I know him.

12 Q. I'll represent that she is on the advisory
13 panel for 3M. Have you seen any literature that she's
14 produced?

15 A. No.

16 Q. If the temperature around the surgical
17 table -- surgical site increased by five degrees when
18 the Bair Hugger was on, would you agree with me that
19 there's going to be a bouyancy force around the
20 surgical table?

21 A. There -- there's a bouyancy force anyway
22 because of the patient temperature and the wound
23 temperature, and that buoyant force is typically very
24 weak compared to the forced-air pressure force coming
25 down from the flow from the ceiling.

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1 Q. And that has to deal with the Archimedes
2 number; correct?

3 A. Yes.

4 Q. Have you ever calculated the Archimedes
5 number in the past 20 years?

6 A. Yes.

7 Q. For what purpose?

8 A. We were looking at the ventilation in hog
9 barns, the air coming in through the slot in one side
10 of the barn and then out through the fans on the other
11 side, exhausted on the other side.

12 Q. Okay. Now let's go through the equation.
13 You know the Archimedes number --

14 Which is dimensionless; correct?

15 A. Yes.

16 Q. -- equals the gravity, which is g.

17 A. Yes.

18 Q. And that's a constant; correct?

19 A. Yes.

20 Q. L, what's L?

21 A. It's a -- a length scale, which typically
22 this is applied to air jets, so it would be the -- say
23 the width from the diameter of that air jet.

24 Q. Okay. And you take one inch.

25 A. Yes, because I was based that -- basing that

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1 on the measurements we made of the velocity leaving
 2 the Bair Hugger blanket that we did.
 3 Q. But where did you make the demens --
 4 Where did you get a length scale of one
 5 inch?
 6 A. Well based on moving the probe around as the
 7 flow is coming out the edge of the blanket, that
 8 seemed to be the width of the jet roughly three inches
 9 from the blanket edge.
 10 Q. Three inches from the blanket edge?
 11 A. Yes.
 12 Q. So you're saying the jet was only one inch
 13 wide?
 14 A. Approximately, yes.
 15 Q. That's all you measured coming out of the
 16 blanket edge.
 17 A. Well I was measuring the velocities and
 18 the -- and the temperature there, and by measuring the
 19 velocities I would move the probe up and down and try
 20 to determine the width of the jet and where the
 21 centerline was.
 22 Q. Let's talk about engineering common sense
 23 here. Okay? You have a blanket with over a thousand
 24 holes blowing 43- to 45-cubic-feet-per-minute air. Do
 25 you agree?

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1 A. Yes.
 2 Q. And you're saying that the length of the air
 3 coming out of that area is only one inch?
 4 A. That's the width of the air jet that I
 5 measured coming out of the blanket.
 6 Q. Okay. Is that the only place the air did
 7 come out of the blanket?
 8 A. No.
 9 Q. Okay. Why didn't you use the length of
 10 where all the air was coming out of the blanket?
 11 A. You could think of the air coming out of the
 12 blanket as -- as being with a certain height and a
 13 certain length along the length of the blanket, so
 14 it's the width of the jet, not the length of the jet
 15 that's important.
 16 Q. So the width as in --
 17 A. Think of --
 18 Q. -- an X axis?
 19 A. Think of a slot. So air coming out of a
 20 slot, which would be coming out the edge of the
 21 blanket.
 22 Q. What would -- is it the hydraulic width
 23 or -- or --
 24 Like what's the width of -- of the air
 25 coming out of this slot here, this air, or

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1 these -- or these slots over here, the air supply?
 2 A. If one looked at an individual slot, it
 3 would be about a half inch.
 4 Q. A half inch?
 5 A. Yeah, for -- for an individual slot.
 6 Q. So you're looking at the width, not the
 7 length.
 8 A. Yes.
 9 Q. Okay. And you're saying when you move the
 10 temperature -- or the -- the measurement device, you
 11 moved it up and down one inch; correct?
 12 A. Moved it up and down sufficient to -- to map
 13 out the approximate width of the jet to be about one
 14 inch.
 15 Q. And did --
 16 How did you measure that?
 17 A. Just by monitoring the velocities,
 18 primarily, as I was moving the probe up and down.
 19 Q. Okay. So you did it by looking at it by
 20 eye. You didn't get a measurement you needed to
 21 scale.
 22 A. No. No.
 23 Q. Okay. So -- so it's your -- it's your
 24 testimony today that the width of the air coming out
 25 of the Bair Hugger blanket three inches from the

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1 blanket is only one inch.
 2 A. Again, that was the representative
 3 measurement I took to try to put a reasonable value
 4 into this Archimedes equation.
 5 Q. Okay. Have you looked at other areas of how
 6 to calculate the length, what other people use in the
 7 field?
 8 MR. GOSS: The width or length?
 9 MR. ASSAAD: The width, so L.
 10 A. Typically, for a -- a slot, it -- it's
 11 always the width.
 12 Q. You do understand, when you're looking at
 13 air jets, length is the distance of how far the air
 14 pene -- jets out from the hole in a perpen -- like a
 15 perpendicular -- if the hole is -- parallel to the
 16 hole; correct?
 17 A. Again, the Archimedes number is the ratio of
 18 Reynolds number and Grashof number.
 19 Q. I understand that. But when --
 20 If you look at other studies, as you look at
 21 act -- the Handbook of Fundamentals, Chapter 20, did
 22 you actually go and look at it?
 23 A. I don't believe I did. Well act --
 24 actually, I may have done that to get this Archimedes
 25 equation. I think I referenced that here.

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1 Q. And did you look at what they -- when they
2 used L, what they were referring to?
3 A. I don't, again, recall that level of detail.
4 Q. Well that's kind of an important detail to
5 know what numbers to put into the equation; isn't it?
6 A. Again, this is a ratio of Reynolds number to
7 Grashof number where L is the same for both.
8 Q. Well L is very important when it comes to
9 calculating the numerator here; correct?
10 A. Yes.
11 Q. Because if L increases, your Archi -- your
12 Archimedes numbers increase; correct?
13 A. Yes.
14 Q. Okay. And if your delta T increases, your
15 Arch -- Archimedes number increases; correct?
16 A. Yes.
17 Q. Okay. These are important numbers; correct?
18 A. Yes.
19 Q. And ambient you used -- you used 70 degrees.
20 Why is that?
21 A. I was trying to estimate the value of the
22 Archimedes number and determine if it's near one, much
23 larger than one, or much less than one to determine if
24 the force convection or natural convection was
25 dominant, so I wasn't paying too much attention to the

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1 absolute numbers here and the precision of the
2 numbers.
3 Q. So you're saying these numbers aren't
4 precise?
5 A. They're not very precise, they're -- they're
6 estimates.
7 Q. Okay.
8 A. Order -- order-of-magnitude estimates.
9 Q. Okay. So if length increases or the delta T
10 increases, you could actually get an Archimedes number
11 greater than one.
12 A. Yes.
13 THE REPORTER: Let's take a five, please.
14 Off the record.
15 (Recess taken.)
16 BY MR. ASSAAD:
17 Q. 2013 ASHRAE Handbook Fundamentals, Chapter
18 20, what is that titled?
19 A. I -- I don't remember offhand the exact
20 title.
21 Q. Is it titled "Space Air Diffusion?"
22 A. It sounds correct.
23 Q. Okay. And do you understand what a
24 hydraulic diameter is?
25 A. Yes.

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1 Q. What's a hydraulic diameter?
2 A. It's the area divided by the perimeter.
3 Q. Okay. And -- and that's for a square;
4 correct? Or a rectangle.
5 A. For any -- any flow area.
6 Q. Okay. And would you agree that, according
7 to Chapter 20, that L should be -- is equal to the
8 length scale of the diffuser outlet equal to the
9 hydraulic diameter of the outlet?
10 A. I guess that seems reasonable.
11 Q. Okay. Is that --
12 Did you calculate the hydraulic diameter?
13 A. Not of the Bair Hugger blanket, no.
14 Q. Okay. So you agree with me if that's the
15 correct definition of what L should be, the number you
16 used is incorrect.
17 A. Again, I was just trying to get a rough
18 order-of-magnitude estimate of the ratio between the
19 buoyant force and the inertia force.
20 Q. That wasn't my question.
21 A. So if I have misread the definition of L,
22 then so be it.
23 Q. So these numbers are incorrect.
24 A. They could be not entirely accurate.
25 Q. Well if something --

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1 I mean engineering is a profession of
2 accuracy when it comes to calculations; correct?
3 A. Yes.
4 Q. Okay. And if you used the wrong formula to
5 calculate -- or if you used the wrong definition of --
6 of length to calculate the Archimedes number, then the
7 Archimedes number is incorrect.
8 A. So the number I have here may be incorrect,
9 yes.
10 Q. Okay. And the delta T, that 75 degrees for
11 delta T is the difference between -- is -- is the
12 temperature you measured in Exhibit B; correct?
13 Seventy-five degrees.
14 A. Yes, it is.
15 Q. And let me ask you another question: Delta
16 T, according to your definition, is the temperature
17 difference between the jet and ambient; correct?
18 A. Yes.
19 Q. And then in the denominator you're supposed
20 to go temperature ambient times velocity square;
21 correct?
22 A. Yes.
23 Q. And you used two different temperatures for
24 ambient here; isn't that correct? One is 66, the
25 other is 70.

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1 **A. Yes. Because the temperature in the**
 2 **denominator I took to be the -- the mean of the two,**
 3 **the -- the jet temperature of 75 and the room**
 4 **temperature of 66.**
 5 Q. Well isn't the room temperature the ambient
 6 temperature?
 7 **A. I guess one -- one -- one could use that**
 8 **definition, yes.**
 9 Q. Well --
 10 **A. It's --**
 11 Q. -- it's your definition here, doctor.
 12 **A. Yes.**
 13 Q. T ambient is the mean absolute temperature
 14 of the jet and its surroundings.
 15 **A. Yes.**
 16 Q. Okay. And how did you calculate 70?
 17 **A. Seventy was -- was an estimate, as I said,**
 18 **between the 75 we measured and the 66 we measured.**
 19 Q. Okay. And -- and the 460 is just to make it
 20 absolute; correct?
 21 **A. That's correct.**
 22 Q. So if you would --
 23 **Would you agree with me that the hydraulic**
 24 **diameter of the Bair Hugger blanket is much larger**
 25 **than one inch? Correct?**

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1 **A. For --**
 2 **MR. GOSS: Object to form.**
 3 **A. For the blanket, yes.**
 4 Q. Okay
 5 **A. For the entire blanket.**
 6 Q. Okay. So you would agree with me that if
 7 you actually used the hydraulic temperature of the
 8 blanket, that that would significantly increase the
 9 Archimedes number.
 10 **A. Say that again.**
 11 Q. If you used the actual hydraulic temper --
 12 hydraulic diameter of the blanket, that would
 13 significantly increase the Archimedes number; correct?
 14 **A. It would change it from the value of one**
 15 **inch I used to perhaps 10, 15 inches.**
 16 Q. Ten, 15 inches.
 17 What's the dimension of the Bair Hugger
 18 blanket?
 19 **A. I'm -- I'm talking about an edge -- one of**
 20 **the edges of the blanket since the air is blowing**
 21 **different directions on different edges.**
 22 Q. Well you can't use an edge because you're
 23 looking at area divided by perimeter; correct? An
 24 edge doesn't have an area.
 25 **A. But the air is coming out between the --**

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1 **what I'll call the blanket over the Bair Hugger**
 2 **blanket and the Bair Hugger blanket itself along an**
 3 **edge someplace.**
 4 Q. You don't know what the Arch --
 5 You don't know what the length is; do you?
 6 You're just using a number.
 7 **A. I can estimate it based on the dimensions of**
 8 **the blanket.**
 9 Q. What are the dimensions of the blanket?
 10 **A. I -- I could hazard a guess. I don't know**
 11 **the exact numbers.**
 12 Q. Okay. So sitting here today, you agree with
 13 me that based on the definition provided by the ASHRAE
 14 Handbook of Fundamentals as to what length is supposed
 15 to be, that the numbers that you have given for the
 16 Archimedes number is incorrect.
 17 **A. That appears to be the case.**
 18 Q. Let's go to Exhibit C of your report.
 19 Exhibit C is titled "Calculation of potential particle
 20 removal between the bottom of the Bair Hugger and the
 21 floor which would also be the case when the Bair
 22 Hugger is sitting on a cart with a flat top." Did I
 23 read that correctly?
 24 **A. That's correct.**
 25 Q. And you are calculating the forces needed to

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1 basically move a particle that's on a floor; correct?
 2 **A. On a flat surface, yes.**
 3 Q. On a flat surface. Okay.
 4 Do you know whether or not Corn and Stein
 5 were looking at -- strike that.
 6 Did you actually read the article that was
 7 authored by Corn and Stein in 1965?
 8 **A. I don't believe I did, no.**
 9 Q. You just looked at the diagram; didn't you?
 10 **A. In the textbook by Hinds, yes.**
 11 Q. Okay. And they're talking about what force
 12 would be required to begin to basically move a
 13 particle on a flat surface; correct?
 14 **A. Yes.**
 15 Q. And the forces is --
 16 Do you know what the direction of the force
 17 was?
 18 **A. Force would have to be horizontal to the**
 19 **surface.**
 20 Q. Okay. So parallel with the surface;
 21 correct?
 22 **A. Yes.**
 23 Q. Okay. So that's not this case here; is it?
 24 There's a vertical component of that force; correct?
 25 **A. Could you clarify "vertical component?"**

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1 Q. Well, you have a particle on -- on the
2 surface; correct?
3 A. Yes.
4 Q. And you have a velocity of air going against
5 gravity up; correct? So there's a force, a suction
6 force on the particle; correct?
7 A. I think it's strictly a -- a shear-force
8 issue where the flow is blowing parallel to the
9 surface the particle is attached to.
10 Q. So you don't think that the upward force has
11 any effect on whether or not a particle is going to
12 move with a certain amount of force?
13 A. I --
14 My understanding of this data, it's based on
15 a horizontal --
16 Q. I under -- I understand that.
17 A. Uh-huh.
18 Q. But we're not just looking at a horizontal
19 force with the -- with the effect of a Bair Hugger
20 sucking in air from the floor; correct?
21 A. If we're looking at particles attached to a
22 horizontal surface, there is no vertical velocity at
23 the surface.
24 Q. Of the particle; correct?
25 A. And the surface.

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1 Q. And the surface. But there's a -- there's
2 a -- there's a force -- there's a force that's -- that
3 the Bair Hugger is exerting on the particles, which is
4 an upward force from suction.
5 A. If you're talking about a particle attached
6 to a surface, --
7 Q. Yes.
8 A. -- I -- I disagree with that.
9 Q. Okay. So you're saying all the -- when --
10 when a --
11 When a Bair Hugger is turned on and it's on
12 the floor and it's -- it is .626 inches above the
13 floor, that the force it exerts on the particle is
14 only horizontal?
15 A. I'm looking at the most likely scenario to
16 dislodge particles attached to the surface.
17 Q. Now what was the point of you performing
18 this calculation?
19 A. I was responding to -- I believe it was
20 Koenigstofer's report.
21 Q. What part of his report?
22 A. Re -- report where he said --
23 If I could go back to my report here. On
24 page nine of Exhibit 1 there's items two and three.
25 "The Bair Hugger draws particles off the floor into

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1 the unit. It functions much like a household vacuum
2 cleaner," and number three, "The air velocity at the
3 floor under the Bair Hugger is sufficient to entrain
4 particles from the floor."
5 Q. Okay. But with respect to Dr. Elghabashi's
6 report, this -- this Exhibit C has nothing to do with
7 his report; correct?
8 A. He's not assuming particles are attached to
9 the floor. They're in a volume.
10 Q. So you agree with me that Exhibit C, the
11 calculations in this report, has nothing to do with
12 Dr. Elghabashi's report; correct?
13 A. That's correct.
14 Q. And it seems here that you calculated the
15 area for a cylinder; correct? The outside area of the
16 cylinder, not the --
17 A. For a sphere.
18 Q. Huh? For a sphere?
19 A. Yes.
20 Where -- where are you looking at?
21 Q. Part of Exhibit C. Under A.
22 A. Oh, under A.
23 Q. PiDH.
24 A. Yes, that -- that's the -- the cylindrical
25 passage between the edge of the filter and the bottom

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1 of the -- I think it was a 505 Bair Hugger model and
2 the edge of the case. That was the --
3 Q. And -- and PiDH is the calculation -- the
4 calculation of the area of a sphere -- or of a -- of a
5 cylinder; correct?
6 A. Yes.
7 Q. Okay. Not a sphere.
8 A. Yes.
9 Q. Okay. And for the velocity of 27 CFM, where
10 did you get that number from?
11 A. I believe that was provided by counsel.
12 Q. They actually gave you 27 CFM for the 505?
13 A. I believe that was correct.
14 Q. And so you relied upon that number; correct?
15 A. Yes.
16 Q. Is there any document they provided to you
17 to give you that number?
18 A. There -- there may have been. I -- I cannot
19 recall.
20 Q. In Exhibit E, what were you look -- what
21 document in here did you use to rely on that 27 CFM?
22 A. Exhibit D?
23 Q. E.
24 A. Oh, E.
25 Q. Under "Materials Considered."

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1 **A. I don't -- I don't think it was a document,**
 2 **it was probably discussion with -- with counsel.**
 3 Q. So when I asked you are there any facts that
 4 you relied upon from counsel and you told me "no"
 5 earlier in this deposition, that wasn't correct.
 6 **A. Apparently you -- you found one that was not**
 7 **in my list.**
 8 Q. Any other facts or -- or information that is
 9 in your report that you obtained from counsel and you
 10 rely upon?
 11 **A. Not that I can think of offhand.**
 12 Q. And with respect to Fig. 6.4 of Exhibit C,
 13 do you know what type of floor or -- or the surface
 14 that the glass beads were on?
 15 **A. Fig. 6.4, those are smooth surfaces.**
 16 Q. Okay. Do you know what the surface is like
 17 in an operating room?
 18 **A. It's, I would assume, not as smooth as the**
 19 **surface as used for these measurements.**
 20 Q. And that would change --
 21 And -- and when the surface is not smooth,
 22 the adhesion force is less; correct?
 23 **A. It's more.**
 24 Q. More?
 25 **A. Yes. Because there's more contact areas**

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1 **between the particles and the surface.**
 2 Q. When it's smooth or not smooth?
 3 **A. When it's not smooth.**
 4 Q. More contact --
 5 **A. Yes.**
 6 Q. -- with the sphere and the surface?
 7 **A. Yes, because of the irregularities in the**
 8 **surface.**
 9 Q. You have facilities at the University of
 10 Minnesota to test the Bair Hugger filtration; correct?
 11 **A. There probably are. But as I said, I'm a**
 12 **retired faculty member and do not really have access**
 13 **to that.**
 14 Q. Okay. But you have colleagues that have
 15 access to it; correct?
 16 **A. Yes.**
 17 Q. Did you ask any of them to -- to do an
 18 efficiency testing on the filter?
 19 **A. No, I have not.**
 20 Q. And you have a clean room in the University
 21 of Minnesota?
 22 **A. Actually, two.**
 23 Q. Two.
 24 **A. Yes. One in the Electrical Engineering**
 25 **Building that was built in the, I think, mid-'80s, and**

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1 **there's a newer one in the -- it's actually a new**
 2 **physics building.**
 3 Q. And they're both still working?
 4 **A. As far as I know, yes.**
 5 Q. And you've used before neutrally buoyant
 6 helium bubbles in your -- in your testing; correct?
 7 **A. I have, yes.**
 8 Q. And that's a -- a reasonable methodology to
 9 follow an airflow; correct?
 10 **A. For low-velocity airflows, yes, in -- in**
 11 **room environments.**
 12 Q. In a what?
 13 **A. In room environments.**
 14 Q. Such as an operating room?
 15 **A. I would think so, yes.**
 16 Q. Okay. Do you know whether or not the Bair
 17 Hugger filters have binders in them, uses binders?
 18 **A. I do not know for certain, but I would**
 19 **assume they did.**
 20 Q. But you would be guessing.
 21 **A. I would be guessing.**
 22 Q. Go to page four of your report. And -- and
 23 with respect to the filter testing, do you know if 3M
 24 has asked anyone at the University of Minnesota to do
 25 any filter efficiency tests?

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1 **A. Regarding the Bair Hugger?**
 2 Q. Yes.
 3 **A. Not that I'm aware of.**
 4 Q. So looking at the diagram of impaction, it
 5 states, "Impaction occurs when the momentum of a large
 6 particle causes it to deviate from a streamline and
 7 collide with a filter fiber..." Did I read that
 8 correctly?
 9 **A. Yes.**
 10 Q. Okay. We talked about this earlier;
 11 correct?
 12 **A. Yes.**
 13 Q. Okay. So looking at this picture here,
 14 that -- would you consider that deviation of a
 15 streamline significant?
 16 **A. Yes.**
 17 Q. Okay.
 18 **A. Uh-huh.**
 19 Q. Then if you go to page five, do you agree
 20 that, based on page five, any particle size greater
 21 than one micron, that its primary source of filtration
 22 is impaction?
 23 **A. I think that's -- as --**
 24 **As the figure indicates here, that would be**
 25 **correct.**

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1 Q. Okay. Would that indicate that particles
2 over one micron rarely follow air streams unless the
3 air stream is not changing?
4 **A. Well with -- within the filtration media,
5 they do not follow the streamlines.**
6 Q. And that would --
7 I mean if they don't follow the streamlines,
8 then the filtration media --
9 If there's a change in the streamline in the
10 regular environment, inertia is going to cause it to
11 deviate from the streamline; correct?
12 **A. As I said before, it depends on the
13 magnitude of the acceleration perpendicular to the
14 direction of flow.**
15 Q. And as well as how intense the turbulence
16 is; correct?
17 **A. Yes.**
18 Q. Do you think it's possible to use a HEPA
19 filter in the Bair Hugger 775?
20 **A. I would say yes, it's possible.**
21 Q. But sitting here today you don't think it's
22 necessary.
23 **A. I do not, no.**
24 **(Discussion off the stenographic record.)**
25 Q. But since the Mistral and WarmAir uses a

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1 HEPA filter, there should be no reason from an
2 engineering standpoint that a HEPA filter cannot be
3 used in the Bair Hugger; correct?
4 MR. GOSS: Objection to form.
5 **A. There are a lot of other variables to
6 consider; you know, the flow rate, the motor size,
7 leakage issues. There would have to be some redesign.**
8 Q. Of course you have to change the motor. You
9 need a more powerful motor; correct?
10 **A. Yes.**
11 Q. You write on paragraph nine -- or page nine,
12 the first paragraph, "The Bair Hugger's incorporation
13 of a MERV 14 filter -- the same minimum filtration
14 level that ASHRAE recommends for air supplied to
15 operating rooms -- provides additional protection from
16 airborne bacteria for patients undergoing surgery."
17 What basis do you have that the filter
18 that's used in the Bair Hugger provides additional
19 protection from airborne bacteria for patients
20 undergoing surgery?
21 **A. So I was referring to the filter in the
22 incoming air into the operating room itself being
23 filtered, as we've talked about, twice, the prefilter
24 and -- and the final filter, and then that air going
25 through a third filter, really, through -- through the**

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1 **Bair Hugger.**
2 Q. And you don't think that air picks up any
3 bacteria or -- or -- or particles between the HVAC
4 system as it goes over the patient and the surgical
5 staff?
6 **A. It certainly could and probably does.**
7 Q. You -- you really have no basis for that
8 statement; isn't that correct?
9 MR. GOSS: Objection, form, argumentative.
10 Q. It's pure speculation; correct?
11 MR. GOSS: Object to form.
12 **A. Again, I was referring to the secondary --
13 the filtration after the filter -- filtered air
14 entering the room.**
15 Q. So you have a fil -- air coming out after
16 it's been filtered twice, and it picks up a lot of
17 junk by the time it gets to the floor, and the Bair
18 Hugger filters that, you consider that additional
19 filtration?
20 **A. Yes.**
21 Q. Okay.
22 **A. Uh-huh.**
23 Q. Okay. Additional protection?
24 **A. It's removing particles from the air, yes.**
25 Q. Well why do you consider it to have

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1 additional protection from the airborne bacteria for
2 patients undergoing surgery? What's additional?
3 **A. It -- it's -- it's an additional removal
4 mechanism of particles in the OR.**
5 Q. Why were you concerned about the particles
6 on the floor or below the operating room table?
7 **A. Again, they -- they could be transported to
8 the surgical site for some reason.**
9 Q. Such as use of the Bair Hugger?
10 MR. GOSS: Object to form.
11 Q. Maybe; correct?
12 **A. Well, possibly.**
13 MR. GOSS: Calls for speculation.
14 Q. Are you aware that --
15 You've read Michael Buck's report; correct?
16 **A. Yes.**
17 Q. And he conducted some of those tests in the
18 clean room at the University of Minnesota. Are you
19 aware of that?
20 **A. Yes.**
21 Q. Have you ever used that clean room?
22 **A. I have, actually. I -- I think so.**
23 Q. Okay. The small one, it's like on the
24 bottom floor of a building.
25 **A. Yeah, the basement floor of the Boynton**

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1 **Health Service Building.**
 2 Q. Okay. When was the last time you used that?
 3 A. **Probably early '90s.**
 4 Q. Okay. Do you disagree with his report that
 5 when the Bair Hugger was turned on, that there was an
 6 increase in particles found in the clean room
 7 regardless of size?
 8 A. **I would have to look at his report.**
 9 Q. Well you've criticized his report, so do you
 10 have the report with you today?
 11 A. **I did not bring it, no.**
 12 Q. Okay.
 13 A. **By the way, I -- I was not provided the**
 14 **tableted results until Friday. All I was able to**
 15 **comment on was his plots up to -- up to Friday.**
 16 Q. So on Friday you also received his -- his --
 17 his results, his numerical results; correct?
 18 A. **Yes. Yes.**
 19 Q. Do you agree, based on what you've seen on
 20 Friday, that there was an increase in particles when
 21 the Bair Hugger was turned on?
 22 A. **Again, I'd have to go back and look at**
 23 **the -- look at the data.**
 24 Q. Okay. Do you know who Andy Streifel is?
 25 A. **I do.**

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1 I'm talking with respect to patient safety.
 2 I understand that every motor needs a filter in front
 3 of it so you don't destroy the motor, like most cars
 4 do and everything like that.
 5 A. **Right.**
 6 Q. Okay. Forget the reasons for protection of
 7 the device. Do you believe that it needs a filter to
 8 protect contamination of the operating room?
 9 A. **It would certainly help protect the -- or**
 10 **ensure the air leaving the blanket is -- is -- has**
 11 **lower concentrations than if the filter was not there.**
 12 Q. Do you believe that the blanket can
 13 prevent --
 14 Is there anything within the blanket that
 15 protects bacteria from coming out of the -- the
 16 perforations?
 17 A. **Because the blanket is made of a**
 18 **non-metallic -- I'm not sure the exact material, and**
 19 **there's a large surface area within the blanket, I**
 20 **would think there would be some -- some deposits**
 21 **within the blanket itself before the particle leaves**
 22 **the holes, yes.**
 23 Q. Okay. But some particles will leave the
 24 holes.
 25 A. **Some particles will leave the holes, yes.**

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1 Q. We talked about that before; right?
 2 A. **Yes.**
 3 Q. Do you know what he does for a living?
 4 A. **He's basically a hospital infection-control**
 5 **specialist.**
 6 Q. Environmentalist; correct?
 7 A. **Yes.**
 8 Q. Okay. And he goes around testing air
 9 quality in hospital rooms; correct?
 10 A. **Yes.**
 11 Q. Do you agree he's an expert in that field?
 12 A. **Yes.**
 13 Q. Have you read an article authored by Ativan?
 14 A. **I --**
 15 MR. GOSS: Avidan?
 16 MR. ASSAAD: Avidan, yes.
 17 A. **I do not recall that I have.**
 18 Q. Do you believe a filter is required on the
 19 Bair Hugger device?
 20 MR. GOSS: Objection, vague.
 21 A. **I would -- I would say it certainly makes**
 22 **intuitive sense to include a filter, yeah.**
 23 Q. Why?
 24 A. **Several reasons. You want to --**
 25 Q. Well for -- forget about --

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1 Q. And some of that will contain bacteria;
 2 correct?
 3 A. **Most likely, yes.**
 4 Q. Okay.
 5 A. **Uh-huh.**
 6 MR. ASSAAD: At this time, doctor, I have no
 7 more questions. I think your counsel might have some
 8 questions.
 9 Thank you.
 10 THE WITNESS: You're welcome.
 11 MR. ASSAAD: Oh. Before I forget, I'm going
 12 to leave this deposition open based on his notes, his
 13 30-page notes we may receive, as well as the photos
 14 that -- we requested some of the photos he's also
 15 received from you.
 16 MR. GOSS: All right. I have a few
 17 questions.
 18 THE REPORTER: Let's go off the record a
 19 moment, please.
 20 (Discussion off the record.)
 21 REDIRECT EXAMINATION
 22 BY MR. GOSS:
 23 Q. Dr. Kuehn, you were asked questions about
 24 notes that you had in connection with your work on
 25 this case. Do you recall that testimony?

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1 **A. Yes, I do.**
 2 **(Discussion off the stenographic record.)**
 3 Q. All right. And those notes included some of
 4 the calculations that are reflected in your report;
 5 correct?
 6 **A. Yes. They were the preliminary calculations**
 7 **I did that ended up in the report.**
 8 Q. Okay. And those notes also included notes
 9 on conversations that you had with me; correct?
 10 **A. Yes.**
 11 Q. All right. Is there anything substantive in
 12 those notes, setting aside the notes on conversations
 13 you had with me, is there any -- any substance in
 14 those notes that -- different from or in addition to
 15 what ended up in your report?
 16 **A. Nothing substantive, no.**
 17 Q. Okay. If you would turn to your report,
 18 please, Exhibit 1, and in particular let's look at
 19 Exhibit B, which is the document -- or it's the
 20 exhibit entitled "3M Lab Measurements," and I believe
 21 you testified earlier that -- that it was your idea to
 22 take some measurements of temperature and velocity
 23 coming from the -- from a setup Bair Hugger; is that
 24 right?
 25 **A. That's correct.**

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1 Q. All right. Why did you want to do that?
 2 **A. I wanted to have first-hand experience**
 3 **rather than relying on second- or third-hand**
 4 **information.**
 5 Q. Okay. And what --
 6 Why did you want the information? What was
 7 it about the information that was pertinent to your
 8 work in the formulation of your opinions?
 9 **A. It was primarily the velocity both leaving**
 10 **the Bair Hugger blanket and near the filter or the**
 11 **intake of the Bair Hugger to address the issues of**
 12 **particle dislodgement and -- and the -- where the air**
 13 **would go once leaving the blanket.**
 14 Q. Okay. And if you'll look at that first page
 15 of the exhibit, these are the measurements that were
 16 taken three inches from the blanket edge where the
 17 picture is shown; is that right?
 18 **A. That's correct.**
 19 Q. All right. And if you compare from a
 20 velocity standpoint the numbers for that measurement
 21 to the -- the numbers taken in other places, can you
 22 comment on any differences there in terms of the
 23 velocity?
 24 MR. ASSAAD: Objection, vague.
 25 Q. I guess what I would ask you is: What does

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1 the -- the first page of the exhibit show you in terms
 2 of the velocity relative to velocity measurements
 3 elsewhere around --
 4 MR. ASSAAD: Objection, vague.
 5 Q. -- elsewhere around the setup that's
 6 depicted here?
 7 MR. ASSAAD: Objection, vague and leading.
 8 **A. I was looking at the -- the --**
 9 **The question arose as what impact the**
 10 **velocity would have leaving the Bair Hugger blanket on**
 11 **the surgical site, air movement through the surgical**
 12 **site, so I was looking at velocities leaving the**
 13 **blanket, as best as I can measure with the setup**
 14 **provided, and determine that these -- these velocities**
 15 **were -- near the blanket were -- were quite high, but**
 16 **then they diminished rapidly as the air mixed with air**
 17 **in the room.**
 18 Q. Okay. You testified earlier about your
 19 efforts to measure the width of the jet from the Bair
 20 Hugger blanket. Do you recall that testimony?
 21 **A. Yes.**
 22 Q. All right. Does this picture on the first
 23 page of -- of Appendix B, is -- is this where you were
 24 placing the probe to try to measure the jet?
 25 **A. Yes, it was.**

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1 Q. Okay. And you'll see the temperature
 2 measurements here begin with the Bair Hugger off, and
 3 it's 66.2 degrees; correct?
 4 **A. Yes.**
 5 Q. All right. And then what happens to the
 6 temperatures subsequently?
 7 **A. The temperatures tend -- tended to rise.**
 8 **And I should probably point out that the**
 9 **order of data shown in the table does not necessarily**
 10 **represent the order the data was taken in the -- in**
 11 **the facility.**
 12 Q. Okay. So the -- the -- the measurements or
 13 the -- the part of the table that counsel was asking
 14 you questions about, the three inches over the hip,
 15 the first two lines of that --
 16 Do you want to flip to that, the three
 17 inches over the hip?
 18 **A. Yes.**
 19 Q. Okay. So the first two rows of the chart
 20 show temperatures at 70.7 degrees Fahrenheit and 71.4
 21 degrees Fahrenheit; correct?
 22 **A. That's correct.**
 23 Q. And that's with the Bair Hugger off.
 24 **A. Yes.**
 25 Q. All right. And then there are two

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1 subsequent measures, 64.9 degrees and 64.6 degrees
 2 with the Bair Hugger on; correct?
 3 **A. Yes.**
 4 Q. And I think you testified earlier that it
 5 didn't make sense to have those values in sequence; in
 6 other words, to have the temperature drop by five
 7 degrees; correct?
 8 **A. That's correct.**
 9 Q. All right. So how would you explain what's
 10 reported on this chart?
 11 MR. ASSAAD: Objection, lack of foundation,
 12 calls for speculation.
 13 **A. As I mentioned before, we do not have a**
 14 **timestamp on any of the data here, so the data**
 15 **presented in a given area were probably taken at**
 16 **different times.**
 17 Q. Okay. What was your overall goal in taking
 18 the measurements reflected in Appendix B to your
 19 report? What was -- what was the purpose of doing it?
 20 **A. I wanted some first-hand experience myself**
 21 **of what the -- primarily the velocities were near the**
 22 **entrance to the filter near the floor and near the**
 23 **edge of the blanket, so the -- and it was really --**
 24 **Obviously, it's not an OR, I appreciate**
 25 **that, so it's not going to be a -- a purely totally**

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1 **accurate, reproducible set of results that one would**
 2 **obtain in an OR. It was intended to be a preliminary**
 3 **study to get some reasonable data in terms of the --**
 4 **mainly velocity, and since we had temperature**
 5 **capability, we also included the temperature**
 6 **measurements.**
 7 Q. So in your review of the plaintiffs' expert
 8 reports, did you -- did you see any measurements of
 9 temperature or velocity around a Bair Hugger in any of
 10 their reports?
 11 **A. No, I did not.**
 12 Q. And was your intent for this preliminary
 13 exhibit to be of publishable quality?
 14 **A. Certainly not.**
 15 Q. Okay. Okay. With respect to your
 16 calculation of the Archimedes number, you were asked
 17 questions about the proper value for L in that
 18 equation. Do you recall that?
 19 **A. I recall that.**
 20 Q. Okay. If the L were a different value, how
 21 would that affect your opinions in this case, if at
 22 all?
 23 MR. ASSAAD: Objection, calls for
 24 speculation.
 25 **A. I don't think it would affect my opinions if**

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1 **we increased L to make it the distance from the edge**
 2 **where the jet was emanated to someplace in the jet.**
 3 **The delta T would also diminish, and so since the**
 4 **Archimedes number is a very low value now, I don't**
 5 **think it would change my opinion.**
 6 Q. Okay. If you look at Exhibit 15, which is
 7 your article that was published in the Journal of
 8 Solar Energy Engineering, pages 369 and the top of
 9 370, and you were asked questions about your
 10 statements about monitoring particles in -- in a
 11 healthcare environment; correct?
 12 **A. Yes.**
 13 Q. All right. And you were asked about the use
 14 of a particle counter to measure the total aerosol
 15 concentration; correct?
 16 **A. Yes.**
 17 Q. All right. Is a particle counter alone
 18 sufficient to measure a bioaerosol concentration in a
 19 healthcare environment?
 20 **A. A particle counter is not capable of**
 21 **measuring -- or distinguishing between a --**
 22 Q. Okay.
 23 **A. -- biological particle and a non-biological**
 24 **particle.**
 25 Q. So what you say here is an alternative is to

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1 use a continuous particle counter for the measurement
 2 of total aerosol concentration versus time with
 3 periodic sampling for bioaerosol. What were you
 4 referring to when you mentioned "periodic sampling for
 5 bioaerosol?"
 6 **A. That periodic sampling for bioaerosols could**
 7 **be done using a -- a sled impactor, for example, or an**
 8 **Andersen impactor.**
 9 Q. And would you need to use those in order to
 10 have a real understanding of the bioburden in that
 11 room or environment?
 12 **A. Yes, because an optical particle counter**
 13 **does not provide information on the biological nature**
 14 **of the particle.**
 15 Q. Okay. I believe counsel asked you
 16 whether -- whether the Bair Hugger use could transport
 17 particles to the surgical site. Do you recall that
 18 question?
 19 **A. I do.**
 20 Q. Okay. What -- what is your -- and --
 21 And I think your answer was "Well,
 22 possibly."
 23 **A. I -- I think that was my response.**
 24 Q. And what did you mean by that or what was
 25 the basis for that response?

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1 **A. I don't think it's very likely, but there**
 2 **are various factors in an operating room that may**
 3 **change, so under certain conditions it -- it could be**
 4 **possible.**
 5 Q. So there are other pieces of equipment in
 6 the OR that move air; fair?
 7 **A. Yes.**
 8 Q. All right. And there are people in the --
 9 MR. ASSAAD: Objection.
 10 MR. GOSS: Sorry, I'm -- I'm leading.
 11 MR. ASSAAD: Object to the form.
 12 Q. Let me -- let me try it this way: What --
 13 what are the different things in an operating room
 14 that could cause the movement of -- of particles to
 15 the surgical site or anywhere else?
 16 **A. Well number one --**
 17 MR. ASSAAD: Objection, outside the scope of
 18 his report, outside -- it's outside the scope of my
 19 direct, and --
 20 **A. Could you repeat the question again?**
 21 Q. Sure. My question was -- hold on a second.
 22 So you said there are various factors in an
 23 operating room that may change. What are -- what are
 24 some of the factors you have in mind there?
 25 MR. ASSAAD: Objection, lack of foundation,

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1 object to form.
 2 **A. Again, I would envision an operating room**
 3 **has several personnel, surgeons, anesthesiologists,**
 4 **other -- other personnel that would be moving tools**
 5 **that would -- that would be in operation, tools being**
 6 **handed to the surgeon and -- and -- and vice versa, so**
 7 **quite a bit of movement around the surgical site.**
 8 Q. All right. You were asked some questions
 9 about a couple of other patient warming products, one
 10 was the Mistral and the other was Warmtouch. Both of
 11 those incorporate HEPA filters, or so you were told
 12 by -- by plaintiffs' counsel. Do you recall that?
 13 **A. Yes, I do.**
 14 Q. All right. Does -- does a HEPA filter
 15 remove 100 percent of particles from the air?
 16 **A. No. Even a HEPA filter allows some**
 17 **particles through.**
 18 Q. And are there potential disadvantages to
 19 using a HEPA filter from an engineering standpoint?
 20 **A. Well a HEPA filter generally creates a**
 21 **higher pressure drop to the filter, which would mean a**
 22 **lower pressure drop on the downstream side of the**
 23 **filter around the fan, which could potentially**
 24 **aggravate any leaks between the filter and the housing**
 25 **or leaks between the filter media and the filter**

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1 **frame.**
 2 MR. GOSS: Okay. That's all I have for now.
 3 MR. ASSAAD: A few follow-up.
 4 RECROSS-EXAMINATION
 5 BY MR. ASSAAD:
 6 Q. What's the definition of a HEPA filter?
 7 **A. A HEPA filter is typically --**
 8 Q. Let me make it quick. Do you agree that
 9 it's a MERV 17 or above?
 10 (Discussion off the stenographic record.)
 11 MR. GOSS: Object to form.
 12 **A. I believe that was in the -- in the ASHRAE**
 13 **table I included in my -- my report.**
 14 Q. And ASHRAE is authoritative; correct?
 15 **A. Yes.**
 16 Q. Okay. So a HEPA filter removes 99.97
 17 percent of .3 microns to one micron; correct?
 18 **A. That's what it states here, although they**
 19 **are typically measured at just 0.3 microns, but then**
 20 **the efficiency actually increases for particle sizes**
 21 **larger than .3.**
 22 Q. So higher than 99.97; correct?
 23 **A. Yes.**
 24 Q. Almost to a hundred percent; correct?
 25 **A. In some particle sizes, yes.**

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1 Q. Well between three to 10 particles, what's
 2 the efficiency rating for a HEPA filter?
 3 **A. I don't have a -- a precise number I can**
 4 **give you.**
 5 Q. Would agree with me that it's larger than
 6 99.999 percent?
 7 **A. I --**
 8 **Again, without looking at -- at the**
 9 **evidence, I -- I -- I could not agree with that.**
 10 Q. Well .3 to .1 for a MERV 17 is 99.97;
 11 correct?
 12 **A. Say that again.**
 13 Q. The efficiency for a HEPA filter at -- at
 14 MERV 17 is greater than or equal to 99.97 percent
 15 efficiency for .3 to one micron; correct?
 16 **A. Yes, that's correct.**
 17 Q. Okay. And when you go from one to three or
 18 three to 10, it will be greater than 99.97; correct?
 19 **A. That's correct.**
 20 Q. Okay. So sitting here today, you are purely
 21 speculating as to whether particle -- particles that
 22 could carry bacteria could pass through a -- a HEPA
 23 filter; correct?
 24 MR. GOSS: Object to form.
 25 **A. Again, HEPA filters are not a hundred**

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1 **percent efficient. It's possible that some very small**
 2 **number could get through at larger particle sizes.**
 3 Q. Well it's definitely less than .03 percent
 4 of the particles, correct, for that size?
 5 **A. Depending on the particle size of interest,**
 6 **that could be true.**
 7 Q. Okay. And you agree with me that a HEPA
 8 filter is going to filter out more bacteria than a
 9 MERV 14 filter.
 10 MR. GOSS: Objection, form.
 11 **A. Yes, I --**
 12 **Yes.**
 13 Q. Okay. Let's think about other --
 14 You mentioned other -- there might be other
 15 factors that could cause contamination of the surgical
 16 site. I think you mentioned people moving, stuff like
 17 that. Is that correct?
 18 **A. Yes.**
 19 Q. Okay. When did you formulate that opinion?
 20 Just outside now when you spoke with counsel?
 21 MR. GOSS: Object to the form.
 22 **A. No. I think I -- I may have read that in**
 23 **some of the ASHRAE documentation on the -- the**
 24 **hospital design guide or somewhere else.**
 25 Q. Where? Is it in your report?

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1 **A. Yes.**
 2 Q. And what's your basis behind that?
 3 **A. I think that's -- that's engineering**
 4 **knowledge about thermal jets as they propagate into --**
 5 **into room air.**
 6 Q. Okay. So you're saying --
 7 But the delta change might actually increase
 8 depending on where you take the measurement.
 9 **A. I have -- I have never seen that.**
 10 Q. Okay. With respect to Exhibit B, you have
 11 no idea sitting here today in what order you took
 12 those measurements; correct?
 13 **A. Not based on what's provided in Exhibit B,**
 14 **no.**
 15 Q. Are they in your notes anywhere?
 16 **A. I was not the one taking the notes.**
 17 Q. Oh. Who took the notes?
 18 **A. Peter and Vinita.**
 19 Q. Okay.
 20 (Discussion off the record.)
 21 BY MR. ASSAAD:
 22 Q. Do you agree that in a typical orthopedic
 23 surgery you're going to have people moving --
 24 You're going to have surgeons; correct?
 25 **A. Yes.**

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1 **A. That specific statement is probably not in**
 2 **my report.**
 3 Q. What's your basis to support that statement
 4 that -- that -- that people moving in the operating
 5 room could cause surgical-site infections?
 6 MR. GOSS: Object to the form. I don't
 7 think that was his testimony.
 8 Q. Did I misstate your testimony?
 9 **A. Without going back and -- and reviewing what**
 10 **I said, it may have.**
 11 Q. Now you also mentioned with the Archimedes
 12 equation that if you change the L, it would change the
 13 delta T. What's your basis behind that?
 14 **A. Because as a heated jet propagates through**
 15 **air, it's going to be losing the temperature**
 16 **difference -- the maximum temperature difference**
 17 **between the -- the jet and at ambient as it gets**
 18 **further away from the -- the source of the jet.**
 19 Q. Well we're not just talking about one jet
 20 here, we're talking about thousands of jets.
 21 **A. I'm talking about the combined air leaving**
 22 **the edge of the blanket entering the room, not that --**
 23 **not individual holes in the blanket.**
 24 Q. And you -- and you are assuming that delta T
 25 would change?

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1 Q. And they'll be moving; correct?
 2 **A. Yes.**
 3 Q. And you'll have other staff in the operating
 4 room; correct?
 5 **A. Yes.**
 6 Q. And the devices, like the anesthesia machine
 7 as well as any other device; correct?
 8 **A. Yes.**
 9 Q. Okay. There's a constant set of people and
 10 devices in an operating room; correct?
 11 **A. I don't know about constant set, but there's**
 12 **certainly a -- a -- a variety of human operations --**
 13 **operators, typically, and equipment.**
 14 Q. And you agree with me that in Elghabashi's
 15 report, that he looked at the impact of the Bair
 16 Hugger with all those -- with people in the room;
 17 correct?
 18 **A. Yes.**
 19 Q. With lights; --
 20 **A. Yes.**
 21 Q. -- correct?
 22 With the back tables.
 23 **A. Yes.**
 24 Q. Okay. And it's because that people are
 25 going to affect the airflow in a room; correct?

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1 A. Yes.
 2 Q. And there's going to be some thermal plumes
 3 that come off from people; correct?
 4 A. Right.
 5 Q. Okay. And when you want to model something
 6 in CFD, in a CFD model, you want to be as precise as
 7 possible; correct?
 8 A. Yes.
 9 Q. If you want to model whether or not
 10 particles get to the surgical site, you'd want to have
 11 a heat source from the lights; correct?
 12 A. Yes.
 13 Q. You'd want to have people in the room;
 14 correct?
 15 A. And they really should be moving as they are
 16 in an actual OR.
 17 Q. Well have you ever tried to do a dynamic
 18 model of a CFD?
 19 A. Very difficult with motion, but that -- that
 20 would be required to do an actual analysis.
 21 Q. I understand that, but -- but -- but say you
 22 want to do a static model, you still would want to
 23 have people in there with a heat source; correct?
 24 A. Yes.
 25 Q. Okay. And you'd want to have the heat

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1 source -- you'd want to have the heat source coming
 2 from the walls; correct?
 3 A. If -- if there is any heat transfer, yes.
 4 Q. All right. And you agree with me that the
 5 more accurate a static model is in the -- in its
 6 modeling, the more accurate the CFD results; correct?
 7 A. If it's set up correctly and the boundary
 8 conditions are done correctly. Again, I'll go back to
 9 the lack of motion of anything in the OR.
 10 Q. Say again.
 11 A. I go back to the lack of motion of anything
 12 in the OR. That's -- that's a major contributor to
 13 mixing of particles.
 14 Q. Okay. Now let's talk about that for a
 15 second. Okay? You agree with me that in a
 16 unidirectional OR such as what's used mostly in --
 17 in -- in orthopedic surgeries, that the purpose of
 18 having diffusers above the surgical table is to offer
 19 a protective effect to help prevent bacteria from
 20 getting into the critical site, the surgical site;
 21 correct?
 22 A. That -- that's the idea, yes.
 23 Q. Okay. And you don't want to have a device
 24 in the operating room that's going to reduce the
 25 protective effect of the ventilation system in an

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1 operating room; correct?
 2 A. You would not want that, yes.
 3 Q. Okay. Because if you reduce the protective
 4 effect of the ventilation system, then you increase
 5 the risks of bacteria entering into the surgical site
 6 from other sources in the operating room; correct?
 7 MR. GOSS: Objection to form, it's beyond
 8 the scope of his opinions, and it is an incomplete
 9 hypothetical.
 10 A. Say that again.
 11 Q. If you reduce the protective effect in the
 12 ventilation system, then you increase the risk of
 13 bacteria entering into the surgical site from other
 14 sources in the operating room; correct?
 15 MR. GOSS: Object to form, beyond the scope
 16 of his opinions, incomplete hypothetical.
 17 A. That -- that could be possibly correct.
 18 Q. Well you have unidirectional flow coming
 19 down; correct?
 20 A. Except the wake regions under the surgeon's
 21 arms and tools and other things are blocking the
 22 airflow.
 23 Q. I understand that. But if you affect the --
 24 the intensity of the protective effect, you basically
 25 decrease the force field around the patient that the

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1 ventilation system is meant to -- to attain; correct?
 2 MR. GOSS: Asked and answered, beyond the
 3 scope of his opinions.
 4 A. Again, I think the full recirculatory -- full
 5 recirculation regions under a surgeon's arms and hands
 6 and -- and tools also disrupt the flow.
 7 Q. I understand that. But you don't want to
 8 disrupt the flow even more with another device;
 9 correct?
 10 MR. GOSS: Object to form, beyond the scope
 11 of his opinions.
 12 A. I think that disruption of the flow would be
 13 much more than a small change in temperature.
 14 MR. ASSAAD: Okay. That's all I have.
 15 Thank you.
 16 MR. GOSS: It's been a long day. I just
 17 have one question. Well, one -- one theme.
 18 RE-REDIRECT EXAMINATION
 19 BY MR. GOSS:
 20 Q. So you --
 21 Counsel asked you whether a HEPA filter
 22 would capture more bacteria than a MERV 14 filter. Do
 23 you -- do you recall that?
 24 A. Yes.
 25 Q. Okay. Have you done any experimental work

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<p style="text-align: right;">Page 349</p> <p>1 yourself to try to quantify the difference in</p> <p>2 bacterial capture between MERV 14 and HEPA?</p> <p>3 A. I have not. That's strictly based on the</p> <p>4 published efficiency value versus the particle size of</p> <p>5 HEPA filters and MERV 14 filters.</p> <p>6 MR. GOSS: And I'll leave it at that.</p> <p>7 MR. ASSAAD: That's all I have. Thank you.</p> <p>8 THE REPORTER: Off the record, please.</p> <p>9 (Deposition concluded.)</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>	<p style="text-align: right;">Page 351</p> <p>1 C E R T I F I C A T E</p> <p>2 I, THOMAS H. KUEHN, hereby certify that I</p> <p>3 have carefully read the foregoing transcript, and that</p> <p>4 the same is a true and complete, full and correct</p> <p>5 transcription of my deposition, except:</p> <p>6 PAGE/LINE CHANGE REASON</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17 THOMAS H. KUEHN</p> <p>18 Deponent</p> <p>19</p> <p>20 Signed and sworn to before me this ____ day of</p> <p>21 August, 2017.</p> <p>22</p> <p>23 _____</p> <p>24 Notary Public</p> <p>25</p>
<p style="text-align: right;">Page 350</p> <p>1 C E R T I F I C A T E</p> <p>2 I, Richard G. Stirewalt, hereby certify that</p> <p>3 I am qualified as a verbatim shorthand reporter, that</p> <p>4 I took in stenographic shorthand the deposition of</p> <p>5 THOMAS H. KUEHN at the time and place aforesaid, and</p> <p>6 that the foregoing transcript is a true and correct,</p> <p>7 full and complete transcription of said shorthand</p> <p>8 notes, to the best of my ability.</p> <p>9 Dated at Minneapolis, Minnesota, this 16th</p> <p>10 day of July, 2017.</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17 RICHARD G. STIREWALT</p> <p>18 Registered Professional Reporter</p> <p>19 Notary Public</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p>	

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